Liberty Bonds Are a Good Buy for You—A Good-Bye for the Kaiser

# MOTOR AGE

Vol. XXXIII
No. 13

CHICAGO, MARCH 28, 1918

Ten cents a copy
Three dollars a year

## TAKE THE HILLS ON HIGH

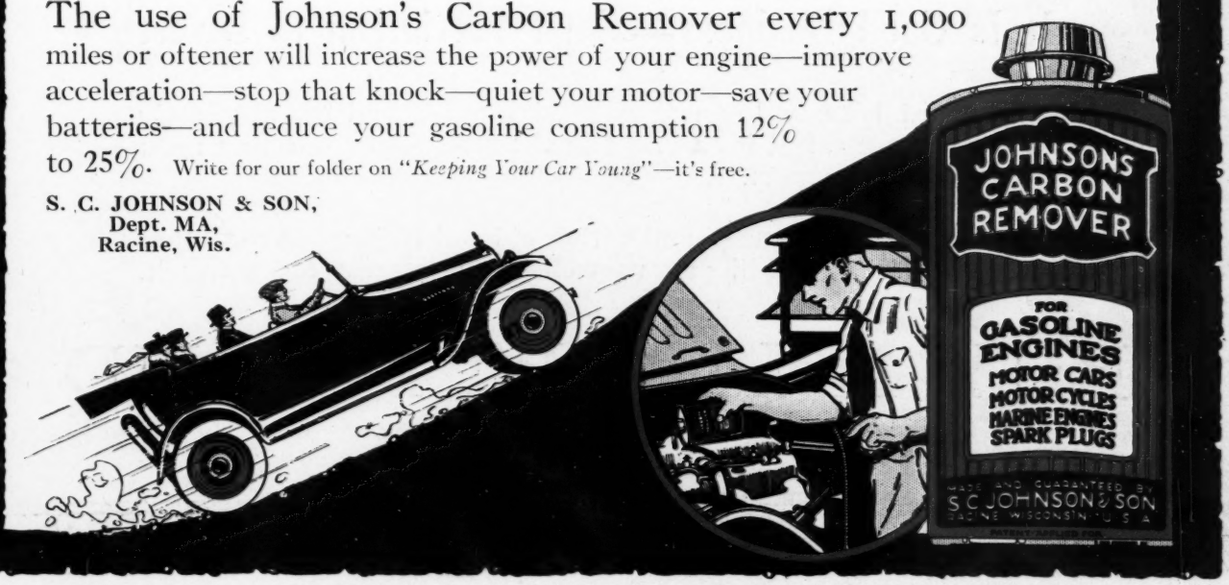
WHEN your automobile limps up hills, knocking in protest at climbing them "on high"—it is a sure indication of carbon. The easiest, cleanest, safest and most satisfactory method of removing carbon deposits is with Johnson's Carbon Remover. It will save you $3.00 to $5.00 over any other method, without laying up your car. No time or labor required—you can do it yourself in five minutes.

## JOHNSON'S CARBON REMOVER

This is a harmless liquid. It contains no acid and does not affect lubrication in any way or interfere with the oil in the crank case. It has no action on any metal.

The use of Johnson's Carbon Remover every 1,000 miles or oftener will increase the power of your engine—improve acceleration—stop that knock—quiet your motor—save your batteries—and reduce your gasoline consumption 12% to 25%. Write for our folder on "*Keeping Your Car Young*"—it's free.

**S. C. JOHNSON & SON,**
**Dept. MA,**
**Racine, Wis.**

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*In This Issue—How Motorists Can Push the Liberty Loan*

# Come On, Fellows!

## Help Shoot Some Sense Into Kaiser Bill

The Third Liberty Loan starts letting daylight through the Huns on April 6th—the first birthday of our war. The more bonds you buy, the more daylight comes through—the sooner our boys come back from the filth and hardship of the trenches, with a couple of scalps you want to see.

So go to your bank, and **buy a bond.** Until the **Third Liberty Loan** is over-subscribed there is **only one investment in the world.** Let's put it over, BIG.

This cover position is cheerfully donated by

**THE HILL PUMP VALVE COMPANY**
**Archer Ave. & Canal St.**
**CHICAGO**

***Manufacturers of famous UTILITY Auto Specialties***

in the service of the greatest cause we know.

## Your Bank Will Help You

If you can't carry a gun, you can carry a Liberty Bond—and your bank will help you.

You'll never miss what you put away each week—but it will pay you well.

Then when you get your bond and clip its coupons twice a year, you will know that **you** are in the great war to win—that **ycu** have helped shoot holes through at least one German—that you have done your bit.

**THIS IS OURS NOW SHALL WE KEEP IT?**

## It Is Good Business—Good Patriotism to Invest

The Third Liberty Loan pays good interest **and it's absolutely sure.** It's **the safest investment in the world**—the one that most deserves your support.

So, let's all come through and wither old Bill Hohenzollern's other arm. Uncle Sam will pay us well, with interest for doing it.

# BUY A LIBERTY BOND

# MOTOR AGE

Published Every Thursday by the
CLASS JOURNAL COMPANY
Mallers Building
CHICAGO ILLINOIS

Entered as Second-Class Matter September 19, 1899, at the Postoffice at Chicago, Illinois, Under Act of March 3, 1879—Member of the Audit Bureau of Circulations—Copyright, 1917, by the Class Journal Co.

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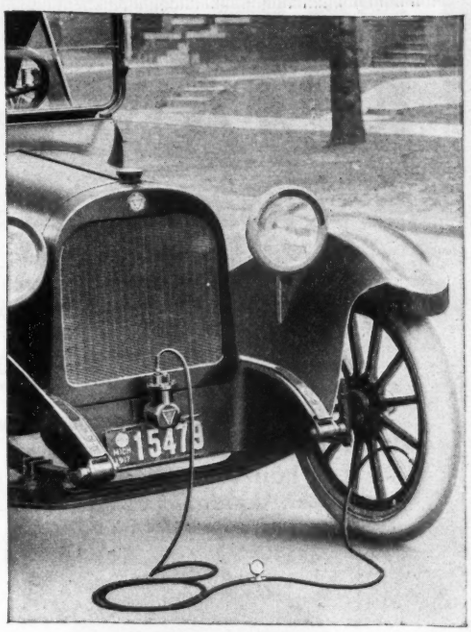

GEARLESS
DETROIT
CRANK-SHAFT
Tire Pump
Pat. Aug. 25, 1915

Has Made Good
In Service and Sales

Of the thousands of DETROIT Gearless Tire Pumps that have been added to the equipment of cars between $800 and $1300, every one has given satisfaction in service.

DEALERS find them the best selling Tire Pump on the market, and STOCK THEM FOR SALES.

On and off in a jiffy, without tools. Not a rubber diaphragm device. Price $10. WRITE.

DETROIT ACCESSORIES CORPORATION
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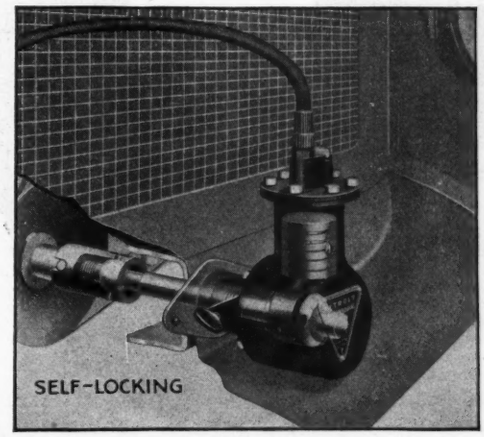


# A Tire Surprise

## *Which Thousands Will Soon Discover*

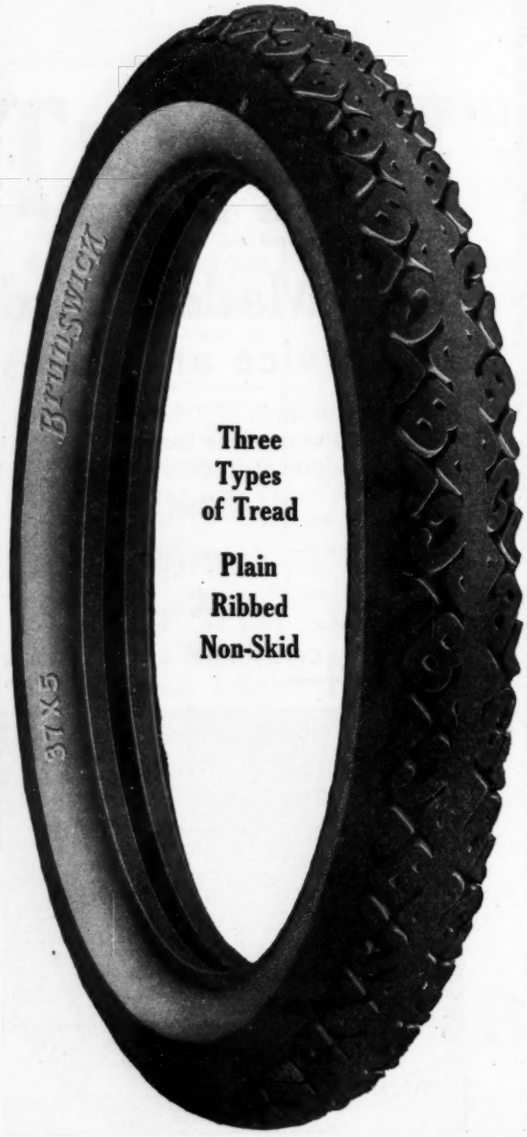
WE HAVE spent two years in preparation for a tire surprise. And now it's ready—in the Brunswick Tire. Not a unique tire, but a super-tire along established lines. A tire that combines all other tires' supremacies.

It comes from the House of Brunswick, which for 73 years has held top place in every Brunswick product.

It comes from a factory newly-equipped, and with up-to-date test rooms and laboratories.

It is built under a staff of experts, selected from great tire-making plants. All have been dominant factors—for 20 years—in pneumatic tire development.

It is built to standards fixed in every detail by a two-year study of the best tires built. All treads, all fabrics, all constructions have been accurately compared.




**Three Types of Tread**

**Plain**
**Ribbed**
**Non-Skid**

### The Brunswick Way

Brunswick success in every line undertaken has been due to super-standards.

Brunswick products, in their kind or class, have always stood supreme. And millions of people know that.

Now, after long preparation, we apply that principle to tires. Every maximum attainment is combined in these Brunswick creations.

Brunswick tires cost you no extra price. Economies in selling pay for all our extra values.

They are sold on a 5000-mile adjustment basis, so you are sure of that much super-service.

See what they give you as compared with other tires. Then tell your friends the facts you learn about them. Try them now. They will bring you new criterions by which to measure tires.

**The Brunswick-Balke-Collender Co.**

**General Offices: 623-633 S. Wabash Ave., Chicago**

*Branches in the Principal Cities of United States and Canada*

# BRUNSWICK TIRES

### *To Dealers:*

Our national advertising is telling these facts to millions every month. Men everywhere are looking for this new high-grade tire. As men try them the demand will multiply. We proved that fully before we ever named them Brunswick.

We have branches everywhere, so supplies are easily obtained. We sell at standard prices.

This line offers you a unique opportunity. The trade that you build will stay. Write for our dealer proposition. Bring this demand your way.

Vol. XXXIII, No. 13 Chicago, March 28, 1918 $3.00 Per Year

# MOTOR AGE

# MOTORISTS!

*The Third Liberty Loan is our share in the winning of this war. Upon it depends the safety and success of 500,000 American soldiers in France*

## Organize to Push the Third Liberty Loan

### HERE IS WHAT YOU CAN DO

#### If There IS a Motor Club in Your Town

1. Get your directors to appoint a Liberty Loan or War committee *at once*.
2. Arrange with local bond campaign committee to supply it cars and drivers.
3. Circularize membership for offers of car for a day. (See Fig. 1, page 6.)
4. Tabulate your replies with telephone numbers and and arrange by days specified.
5. Appoint subcommittee to see entire membership for bond subscriptions through club.
6. Appoint subcommittee to see house members and employees of club.
7. Get Liberty Loan stickers on the windshield of every member's car. (See Fig. 2, page 6.)
8. Arrange for time payments.

#### If There Is NO Motor Club in Your Town

1. Arrange *at once* for a speaker from your local Liberty Loan committee to talk to motorists of town.
2. Get three or four motoring friends to meet and draw up call for public meeting of motorists. Use local papers and mails for call.
3. Organize a Motorists' War committee at this meeting when called.
4. Arrange with local Liberty Loan committee to supply it cars and drivers for campaign.
5. Circularize motorists of city and vicinity for offers of car for a day. (See Fig. 3, page 6.)
6. Tabulate your replies with telephone numbers and arrange by days specified.
7. Appoint a subcommitte to see every motorist for bond subscriptions.
8. Get Liberty Loan stickers on windshield of every car.

**HOW YOU CAN DO IT—Page 6**

# Organize to Push the Third Liberty Loan

# HOW YOU CAN DO IT

## *If There Is a Motor Club in Your Town*

**1** Get your directors to appoint a Liberty Loan committee *at once*. Perhaps the name War committee may be preferred to that of Liberty Loan committee, because then the same organization can be used in other war work after the bond campaign is closed. The War committee should include the ten or fifteen livest men in your club. This will include you, because if you were not a live one, you would not have taken the first step. It should include the chairman of the House committee.

**2** Get in touch with the local Liberty Loan Campaign committee. Arrange to supply cars to it for the distribution of posters, etc., and for transportation of the Four-Minute men and other speakers as well as for the solicitors. This will give every member of the club a chance to offer his car and some of his time.

**3** Circularize your members, urging them as a patriotic duty to place their cars with their services or those of a driver for at least one day at the call of the local bond campaigners. Inclose a return postal, making reply easy. A suggested form is shown in Fig. 1.

**4** Tabulate this list with addresses and telephone numbers by days, as specified on the return postals, so that you will know whom to notify today for service tomorrow.

*Fig. 2—Suggestion for sticker*

**5** Appoint a subcommittee to see every member of your club, urging that he make a bond purchase through the club in addition to such other purchases as he may make personally or through other organizations.

**6** Appoint a subcommittee, with the chairman of the House committee as chairman, to see personally members who live at the club and all club employees. This committee can arrange for a speaker to talk to the club employees.

**7** Arrange with a bank to carry time-payment subscriptions.

**8** Get Liberty Bond stickers from local Liberty Loan committee and send one to each member to put on his windshield. It might be worth while to get up a special sticker or transparency bearing the club emblem. Fig. 2 is a suggestion.

......, 1918.

Secretary, War Committee,
Kerry Motor Club:
I want to help with the

LIBERTY LOAN

and hereby offer my car with the services of {myself / my driver}

for ..... days. The first day will be the .....th (day)

of ..... (month)

My car seats ....

Signed.....

..... St.

Phone (Bus.).....(Res.).....

*Fig. 1—Suggestion for blank if you have a club*

.....,1918.

R. C. McCain, Chairman,
Jefferson Township Motorists' War Committee:
I want to help with the

LIBERTY LOAN

and hereby offer my car with the services of {myself / my driver}

for ..... days. The first day will be the .....th (day)

of ..... (month)

My car seats ....

Signed.....

..... St.

Phone (Bus.).....(Res.).....

*Fig. 3—Suggestion for blank if you have no club*

# *If There Is No Motor Club in Your Town*

**1** Get in touch with your local Liberty Loan committee *at once*. Have a speaker from your local Liberty Loan Campaign committee or State Council of Defense ready to tell the motorists what they may do toward pushing the loan.

**2** Get three or four of your motoring friends — wide-awake ones — together and draw up a call for all motorists of the town to meet at some public hall. Have this call published in your local papers. Get from your secretary of state a list of car owners in and near your town and send the call to each by mail.

**3** Organize a Motorists' War committee at this meeting. This name may be preferable to that of Motorists' Liberty Loan committee, as the organization may be used for other work after the bond campaign is over. This committee should include the ten or fifteen livest motorists in your city. This will include you, because if you were not a live one, you would not have taken the first step.

**4** Arrange to supply cars to your local Liberty Loan Campaign committee for the distribution of posters, etc., and for the transportation of its speakers, but chiefly for getting its solicitors from place to place in their territory. This will give every motorist an opportunity to offer his car and some of his time.

**5** Circularize the list of motorists, urging them as a patriotic duty to place their cars with their services or those of a driver for at least one day at the call of the local Bond Campaign committee. Inclose a return post card, making a reply easy. A suggested card is shown in Fig. 3.

**6** Tabulate this list with addresses and telephone numbers by days as specified on the return postals, so that you will know whom to notify each day for service the next.

**7** Appoint a subcommittee to see every motorist on your list, urging that he make a bond purchase through your committee in addition to such other purchases as he may make through other channels. This subcommittee should arrange with a local bank for carrying time-payment subscriptions.

**8** Get Liberty Bond stickers from local Liberty Loan committee and send one to each motorist on your list. Urge him to put it on his windshield.

## Do You Need an Argument?

THEY say, who have come back from Over There, that at night the troubled earth between the lines is carpeted with pain. They say that death rides whistling in every wind, and that the very mists are charged with awful torment. They say that of all things spent and squandered there young human life is held least dear. It is not the pleasantest prospect for those of us who yet can feel upon our lips the pressure of our mothers' good-bye kiss. But, please God, our love of life is not so prized as our love of right. In this renaissance of our country's valor, we who will edge the wedge of her assault make calm acceptance of its hazards. For us, the steel-swept trench, the stiffening cold — weariness, hardship, worse. For you for whom we go, you millions safe at home — what for you? We shall need food. We shall need care. We shall need clothes for our bodies and weapons for our hands. We shall need terribly and without failure supplies and equipment in a stream that is constant and never-ending. From you who are our resource and reliance, who are the heart and hope of that humanity for which we smite and strive, must come these things. Buy your country's bonds. Buy them today! The United States Government Bonds of the Second Liberty Loan of 1917 are investment made safe for the people. They are in the highest possible sense a security *of* the people, *by* the people, *for* the people. They can be had in denominations so low and on such terms that virtually every citizen of this nation may share in the benefits they bring and the purposes they serve. They are today the safest possible investment in the world. Buy your country's bonds. Buy them as the mainspring of our holy endeavor. As your duty to the cradle and your fealty to the tomb, buy them. Buy them today!

*(Signed)* Citizen Soldier No. 258,
*——th District National Draft Army*

*By the Union League Club, Chicago.*

# How Would You Like to Have the Gentle Hun Come to Your Town?

No! Then buy Liberty bonds and keep him out

# Mail Trucks for Man Power

## Efficient Use on Rural Routes as Remedy for Increasing Shortage of Labor

WASHINGTON, March 22—The great opportunity for increased use of motor trucks in the rural mail service of all sections of the country was outlined to-day by John R. Blakeslee, fourth assistant Postmaster General in charge of rural mail delivery. Mr. Blakeslee declares that there is a 10 per cent reduction in the productivity of the man power around Washington due to a lack of transportation in this zone. Next winter we will be 10 per cent short of men, and this must be compensated for by some measures. An increase in the service offered by rural mail delivery is considered one of the great possibilities.

There are 44,000 rural mail routes in the country and these average but eight pieces per route per day, which is less than 10 lb. On the return trip these average less than one piece per day per route from the farms, which is an average of less than 1 lb. per day per farm. Mr. Blakeslee sees no reason why by the rural delivery system the capacity of the farmer should not be increased. Through these channels the produce of the farm can be quickly transported to where it is required, and the merchandise from the city can be transported to the farmer, without the farmer having to go to the market for it. These 44,000 delivery routes offer flexible channels for such work.

### Rearrangement of Routes

At present too many of these rural mail routes are not laid out with the thought of making them efficient; they literally start from nowhere and end nowhere. A rearrangement of them is necessary so that at one end of the route there will be the town or city market requiring produce which can be brought in by parcel post delivery, and at the other end the productive country areas which can furnish the food supplies for the cities.

With this object in view Mr. Blakeslee has been working on experimental rural mail routes which are not circuits but rather out and return routes over the same distance, this plan being adopted to increase trade for a parcel post service both ways. An example of such a route and how it is possible to develop business over it is from Lancaster, Pa., to Gettysburg, to Baltimore, Md., a total distance of 105 miles. On the first day of this motor route only 56 lb. of food produce from the farms were collected for the city markets, but after it had been running seventeen days the daily load had increased to 2200 lb. Soon two motor trucks were necessary to serve this route. Before this experiment was tried there was no thought of any necessity for a motor route over this area as Lancaster possesses ample agricultural facilities to supply its needs. The same is true of Gettysburg. The same is true around Baltimore. In spite of these apparently unfavorable conditions the route has proven very successful. In addition to carrying parcel post matters, first-class mails are carried.

An example of how these rural mail routes are not laid out as feeders for the city areas, in bringing such food from the country areas, is evident from the fact that from fifty-two of the largest cities in the country there are only 256 important rural routes leading out of these cities, and these rarely lead into the country areas but generally circle through the suburbs. Of these 256, 172 lead out of St. Louis, Mo. No rural routes leading into the productive farm areas radiate out of such cities as New York and Philadelphia, although it is just from such centers that such routes should radiate to make the food supply from the country to these cities more flexible.

Surveys of the rural route situation have been made out of such cities as Chicago, Denver, St. Paul, Detroit and Grand Rapids, with the thought of establishing 100-mile routes from these cities into the country and back over the same roads. An example of how such a route works out is Savannah, Ga., where there is a route to Statesboro, a distance of 50 miles. Savannah is the center of desert so far as the production of food is concerned, and it is not before you are 25 miles out of the city that you reach the productive area. It is possible with this 50-mile route to tap this productive area and bring the farm produce to the city.

Examinations of parcel post shipment have disclosed the fact that much farm produce is taking a very indirect road to the market, where as with the rural motor parcel post system it would go direct. Here is an example: On a parcel post route out of Philadelphia is the small town of Oxford, which is a great mushroom center. From it 1700 lb. per day are shipped by motor truck to Philadelphia, where they are reshipped by the postoffice mail system to New York, Lansdale, N. J., Washington, Baltimore and other places. If these were transported direct from Oxford to Lansdale by motor, it would be a 35-mile trip, whereas the way they are handled at present the distance is 177 miles. It is possible by a rearrangement of the parcel post routes to cut down these transportation burdens. It was discovered that in Lansdale there is a firm which reships these mushrooms, sending some of them back to Philadelphia, and others to Baltimore and Washington, so that the mushrooms travel back and forward over the same route.

Another example of how the motor rural delivery system could care for this farm-city transportation is the postoffice of New Holland, Pa., which ships 25,000 crates of eggs per week. Many of these eggs reach New York in an indirect way through the railroad postoffice, which means many handlings. It is possible to send eggs direct from New Holland to New York and deliver them direct to the customer. There is no reason why such delivery direct to the customer should not be done by parcel post or fourth-class mails, because it is done with the first-class mails. Sending these eggs through the regular postoffice channels requires twelve handlings where one should suffice.

Shipping thirty crates of eggs from Vineland, N. J., to New York now requires fourteen handlings, the handling of more than 100 men and several hundred operations. The cost of the eggs is doubled by the cost of these operations in transit. The time consumed between the farmer and consumer is more than doubled, and yet this distance is less than 100 miles. If motor trucks operating in the parcel post organization traveled between Vineland and New York, the operation of handling the eggs would decrease to two. The time for shipment from Vineland to New York would be slight. One motor truck could haul fifty crates of eggs direct from Vineland to New York in a day. At present the weight limit of any parcel post package is 70 lb. This admits of a bushel of potatoes, 62 lb., or a crate of eggs, 52 lb.

### Eight on This System

At present eight different rural routes are operating on this system. Some of them have one and others two trucks. They operate to cover the route each way once per day. If the route is short one truck makes a return trip. If too long for this, two trucks are used, one starting from each end of the route each day. The routes are as follows:

Route 1—Philadelphia to Atlantic City, 107 miles. A truck leaves from each end each day. They meet at Vineland midway.

Route 2—Baltimore to Solomons, Md., 92 miles. A truck leaves from each end daily, but the one leaving from Solomons waits until the one from Balimtore has arrived.

Route 3—Washington, D. C., to Leonardstown, Md., 55.7 miles. Two trucks make the round trip each day, starting from opposite ends.

Route 4—Washington to Baltimore, 76 miles. The two trucks start from opposite ends and meet at Mount Airy, where they turn and where they exchange loads as necessary.

Route 5—Lancaster to Baltimore, 105 miles. Two trucks, one from each end, meet at Gettysburg, where they exchange loads and return over their respective routes.

Route 6—Baltimore to Philadelphia,116 miles, via Oxford. A truck leaves from each end. They meet at Oxford, where they return over their routes. Oxford has a population of 2390.

Route 7—Savannah, Ga., to Statesboro, Ga., 55.5 miles. One truck makes the trip out one day and back the next.

Route 8—Columbus, Ohio, to Zanesville, Ohio, 55 miles. One truck makes the round trip daily.

(*Concluded on page 47*)

# *Hop on the Band Wagon!*

Make your Liberty bonds help blind the Kaiser

# Cost of Driveaways

## Cars Go Overland to New York at $110 to $115 a Car on an Average

### Good Roads Are Big Factor in Expense

NEW YORK, March 22—Driveaways from the factories to New York dealers have started in earnest. Few cars are being received any other way at present and it is anticipated that the number of cars coming over the roads will increase steadily for the next few weeks as the highways get into better condition and the snows and mud disappear.

As some indication of the number of cars that are coming in, four examples may be cited. The Oldsmobile Co. received this week a convoy of fifty cars, the same number having come in last week; the Buick branch expects thirty-four cars this week; the Colt-Stratton Co., Dodge Brothers dealer, has a squad of twenty drivers on the road now; Maxwell expects a convoy including four trucks, each carrying a sedan, four roadsters and three touring cars. These, together with two trucks which will be dropped in Utica and a roadster which leaves the convoy at Rochester, left Buffalo Wednesday and will reach New York early next week.

**Cost of Driveaways**

The cost of driving cars from Michigan factories to New York varies slightly, but in general may be put at between $110 and $115 per car average. Where no trouble is experienced, such as smash-ups, etc., the cost may be considerably lower if the roads are good and the time cut to the minimum. Generally it takes an average of about seven days from either Flint or Lansing, though in some cases ten days are required. From Buffalo dealers generally allow about five days.

The Oldsmobile company kept careful track of all expenses connected with bringing down the last convoy of fifty cars and from the table given herewith it may be seen that quite a little damage was done to paint and varnish enroute:

| | |
|---|---|
| Gasoline and oil | $ 990.81 |
| Fifty men at $3.60 a day, nine days and one day going | 1,800.00 |
| Expenses, fifty men at $2.50 a day | 1,250.00 |
| Railroad fare, fifty men at $15.33 | 766.50 |
| Ferry and tolls | 89.40 |
| Licenses | 250.00 |
| Expense, man to York, Pa., with licenses | 20.00 |
| Twelve damaged fenders | 150.00 |
| Touching up and varnishing thirteen cars at $20 | 260.00 |
| Wash and polish fifty cars | 50.00 |
| Nine splash pans | 18.00 |
| Dent in back, two guards and refinishing one car | 65.00 |
| Total | $5,772.71 |
| Average per car | 115.45 |

The Buick Motor Co. finds it very bad practice to start a convoy of thirty or forty cars off all at once. This means congestion on the roads, and when small towns are reached for noon or night stops there are insufficient facilities for boarding the men and caring for the cars. Furthermore, the men are likely to skylark at night and this means a late start the next morning, when early starts are imperative if schedules are to be maintained.

The best plan has been found to send the cars away in groups of five, each group with a captain, who is responsible for all the drivers and cars in the group. Each group is sent away perhaps an hour after the preceding one. This eliminates congestion on the roads and at the ferries, gives the small town restaurants a better chance to feed all the men and separates the drivers into small groups that are more likely to go to bed at the proper hour.

The present method is to pick up drivers in New York and pay their railroad fare to Flint or to Buffalo. Little trouble has been experienced in getting good men. One driver, however, who was accustomed to another make of car, drove a Buick about 300 miles in second gear at about 30 m.p.h. and burned out the bearings. But this is about the only trouble that has been encountered along these lines.

Later, when the roads get better and schedules can be adhered to more rigidly, it is planned to relay the drivers, one squad staying with the cars one day and returning that night or the next morning to the starting point. Another group of drivers then would take the cars for the next day, and so on.

# Price Increases

Cleveland, Ohio, March 22—Prices of Winton Six cars are $200 and $350 higher this week than they were last. The 48-hp. model has increased $350 to $3,850, while the 33-hp. is $200 higher, or $3,150.

Elkhart, Ind., March 25—The prices of the Crow-Elkhart cars have been increased, effective to-day, as follows:

| MODEL | OLD PRICE | NEW PRICE |
|---|---|---|
| 2-pass. roadster | $935 | $ 995 |
| 5-pass. touring | 935 | 995 |
| DeLuxe roadster | 995 | 1,055 |
| DeLuxe touring | 995 | 1,055 |

Cleveland, Ohio, March 25—Increase in prices of materials from 10 to 175 per cent during the last ten months is given by the Baker R. & L. Co. as ample explanation of its increases in price, which take effect April 1. The brougham type will be advanced $150, or to $3,150, and the coach type will be advanced $200, or to $3,400.

Lansing, Mich., March 22—The Oldsmobile eight is now $1,495 instead of $1,467 and the six has increased $10 making it now $1,195. The new building just completed for the Olds Motor Works is being used for storage, pending the installation of machinery for production. The company has received a small order from the Navy department for cars to be used by officers. The quantity is not stated.

Detroit, March 22—The Columbia Motors Co. has increased its prices $100. The touring car now is $1,450 and the sport model is $1,595. The company reports business generally good. It received within the last ten days more orders than it will be able to fill in two months, and will start shipment on trailers in ten days. The building heretofore used for storage now is used to assemble these vehicles. Of the passenger car production, 50 per cent is driven away.

# Call to Man Air Fleet

## America Wants 5000 Draft Registrants to Enter Training for Service

### Men Will Be Thoroughly Instructed in Schools

WASHINGTON, March 25—Special telegram—Five thousand draft registrants will be called this week to assist in the maintenance of America's air fleet. A call for men is made on Illinois, Minnesota, Iowa and Indiana. A thorough training course in woodworking and gas engine operation and repair will be given these men at 14 educational institutions selected by the Government. Voluntary induction will be tried, but where the states fail to produce the required quotas men will be conscripted. Registrants must have at least a grammar school education to their credit.

Assignments to duty will be made according to ability shown. The schools and quotas of each state are as follows: Minnesota, 300 men to Carnegie School of Technology, Pittsburgh, Pa., 500 men to University of Cincinnati, 500 to University of Minnesota, 189 to Pennsylvania State College and 330 to University of Pittsburgh.

Illinois, 100 men to University of Chicago, 200 to Lewis Institute, 100 to Northwestern University, 300 to Bradley Polytechnic Institute.

Iowa, 100 to New York University, 400 to Wisconsin University, 500 to the Automobile and Tractor School, Kansas City, Mo., and 500 to the Sweeney Automobile School, Kansas City.

Indiana, 500 men to Purdue University.

These schools have been selected following thorough investigation of the country's educational institutions by the Federal Vocational Board.

### GRANT ADVANCES PRICES

Cleveland, Ohio, March 22—The Grant Motor Car Co. has advanced the price of its six-passenger models from $1,055 to $1,095.

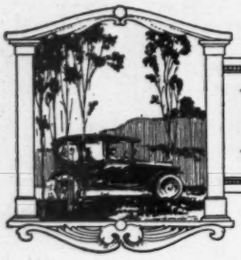
### SAXON ADVANCES $50

Detroit, March 25—The Saxon Motor Car Co. will advance the price of its six-cylinder touring model $50, from $995 to $1,045, effective April 9. The four-cylinder model has been discontinued.

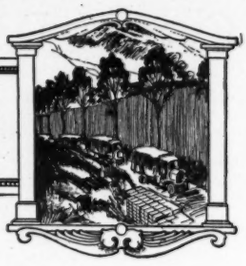
### DEERING MAGNETIC PRICES

Chicago, March 25—The prices of the new Deering Magnetic car, the product of the Magnetic Motor Corp., have been fixed definitely and are as follows: Seven-passenger and four-passenger touring, $3,950 each; coupe, $4,850; sedan, $4,950.

Six different standard color combinations are offered, Mist O'Marne blue, Rolls-Royce blue, Holland blue, Beaver brown, Liberty green and Strong wine. Territory is being assigned, and delivery of the seven-passenger and sedan is expected to start in April.



# EDITORIAL PERSPECTIVES



## By Motor to the Training Camps

YOU who have relatives or friends among the boys in service at the army and navy training camps can visit them by motor. April 4—next week—MOTOR AGE will tell you how. The fifth annual touring issue will feature the training camps and cantonments as the objectives of this summer's touring. The touring issue will tell you how to get there in your car, the best roads to use, what accommodations there are for you, your family and your car, and how to prepare for the trip.

MAKE your visit by motor and help our boys at the front by relieving the railroads of the necessity of transporting you and your luggage. Uncle Sam needs the railroad space—you and your family need the outdoors.

DO YOU know about the Hostess Houses at the cantonments and the other meeting places within the camps? Do you know of the special rules in and around the camps?

MOTOR AGE tells you this next week. It also gives detailed route maps to the chief cantonments and training stations from nearby cities.

THE exact location of nearly every government post, training camp, aviation site and garrison, with the main routes leading to them, will be shown on a large supplementary map printed in colors. Also the army truck roads are shown.

ALSO those points of historical interest which the war has brought to the fore, such as the famous battlefields, headquarters of heroes of other wars, etc., will be shown, as will the main roads to them. In addition supplementary maps will show other features, such as the locations of tourists' camping grounds and the National parks and monuments. Practical touring equipment, both home-made and on the market, will be described and illustrated, as will practical methods of carrying and using it.

## The Supreme Issue—Ships

THIS war has taught the world that time is the all-important factor in our existence. It enters into all of our activities whether commercial or otherwise. Tremendous production is possible by time-saving. This is demonstrated by the fact that our industrial production is at a height never before thought possible. Standardization is chiefly responsible for this increase.

THE supreme issue of the war is ships. The U-boat is a real menace and is not to be passed over lightly. Perhaps this fact can be brought home more forcibly by stating that last year the U-boat sunk about three tons to one constructed. And the one ton constructed accounts for the entire production of all the allies.

PERHAPS before the summer is over it may be necessary to transport men from the less important industries in the inland cities to the great ship-building establishments on the seaboards to speed up our ship-building program. Standardization is bound to play an important part in ship building. It must. How else can it be done and be done expeditiously?

STILL another important factor must be considered. To secure real results control must be centralized and not distributed. Advisory boards are all right in peace times but not in war times. We want a board that can build ships.

EVERYONE knows why we need ships or at least should know. If the army in France is to be increased, it automatically reduces the number of transports to keep up the food supply. There is a definite limit to the troops we can place in France and still be in position to feed them. Ships is the real issue of the day. Standardization, men, centralized control are necessities.

## Parking on the Roof

IT is possible that present-day parking difficulties which are bothering the city motorists may take a different aspect within the next decade. To those who have been watching the development of the airplane and particularly the vast increase in its use brought about by the war, there is little difficulty in imagining a time not so many years in the future when we will be bidding for parking space on the roofs of our skyscrapers. Most inventions pass through three stages of development.

A WRITER in the publication of the Cleveland Automobile Club places the airplane in this second stage, in that it has passed the experimental so far as its practicability is concerned and is now in the expert state, such that it is entirely feasible as a means of transportation to those who have been skilled in its use. In other words, it is in the same stage that the motor car was in ten years ago and in which the railway locomotive now is in.

RELEASING of the thousands of skilled aviators, who are being trained and who will be trained in war flying, will do much toward hastening the commonplace stage. So also will the vast development in reliability and power of the planes themselves. To dream of utilizing our roof tops as parking space for the vehicles which bring us downtown to our daily work is not as wild a thought as it might seem at first. Realization of that dream may not be so far off.

## School Boys and Tractors

IT is natural for a boy to want to see for himself what makes things go. Through the courtesy of the International Harvester Co. in placing its retail showrooms at the service of the Chicago high schools, this propensity to work with machinery is given a chance among the 1500 or so boys who are preparing to go out onto the farms this summer to help. Underlying the boyish curiosity and delight at being permitted to pull levers and to turn wheels there is noticeable a keen desire to learn.

THE possibilities of such instruction are immense. Particularly is this the case as respects the value of instruction in the operation of farm motors. The insistent need in the future on the farm will be for competent operators of farm tractors. The facilities which the display rooms and the implement and tractor factories of Chicago and other cities afford for thoroughly practical instruction in farm mechanics very easily might be hooked up with the manual training in the schools to the end that boys who manifest a predilection in this direction might be given both technical and practical instruction. It is too bad that the schedule of the course does not permit more on the tractor. Farm mechanics is a fascinating study and much might be developed by its teaching.

## Saving Daylight

WASHINGTON, March 22—Congress has passed the daylight bill and it has been signed by President Wilson. The daylight saving bill is designed to saving time, light and fuel. It also will supply an additional hour for home gardening by city and suburban dwellers after office hours. Under this bill the clocks will be turned an hour ahead at 2 o'clock in the morning of the last Sunday in March of each year and will be turned back an hour at the same time on the last Sunday in October of each year. The Senate agreed to the House amendment, which extended the time of daylight saving from five months to seven months, making the bill read March instead of April, and October instead of September.

**How to Do It**

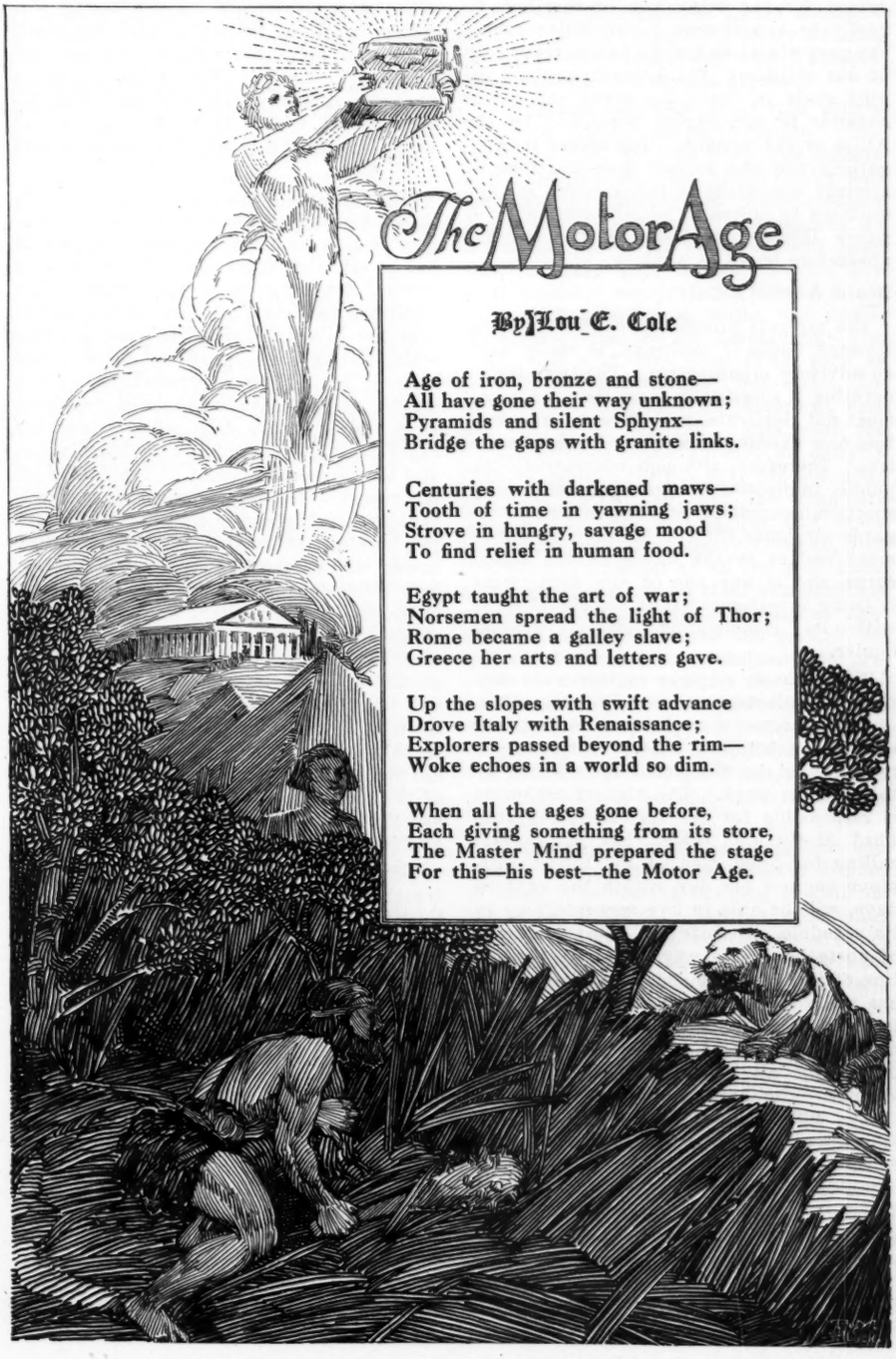
Move the hands of your clocks and watches forward an hour before retiring on the night of March 30, 1918. Move the hands of your clocks and watches backward an hour before retiring on the night of Oct. 26, 1918. After turning the hands as directed forget about the plan entirely. Thus the daylight saving law is placed into and out of operation.

### LIMA LAUNCHES WAR TRUCKS

Lima, Ohio, March 22—The first convoy of U. S. A. standardized war trucks, comprising thirty-three of the standardized trucks, left Lima this afternoon enroute for the eastern seaboard. This is the first convoy of the standardized trucks to travel overland from here for overseas duty and marks the beginning of huge production of the trucks. Complete sets of parts are now in hand in assembly plants for more than 500 of the class B standardized trucks.

### LIBERTY LEADS SEAPLANE ENGINES

Washington, March 23—The Navy seaplane carrying a Liberty engine made another official test flight here yesterday accompanied by several other seaplanes. The plane equipped with the Liberty engine quickly outdistanced the others, and the test was announced to be highly satisfactory.


The Motor Age
By Lou E. Cole
Age of iron, bronze and stone—
All have gone their way unknown;
Pyramids and silent Sphynx—
Bridge the gaps with granite links.
Centuries with darkened maws—
Tooth of time in yawning jaws;
Strove in hungry, savage mood
To find relief in human food.
Egypt taught the art of war;
Norsemen spread the light of Thor;
Rome became a galley slave;
Greece her arts and letters gave.
Up the slopes with swift advance
Drove Italy with Renaissance;
Explorers passed beyond the rim—
Woke echoes in a world so dim.
When all the ages gone before,
Each giving something from its store,
The Master Mind prepared the stage
For this—his best—the Motor Age.

# Status of Airplane Program

## Confusion of Priorities and Exaggerated Ideas of Ability Charged with Reason for Delay

WASHINGTON, D. C., March 26—(Special telegram.)—Summing up following interviews and investigations here, it can be stated that there is no great need for alarm over our airplane program. There is a delay. Neither the government officers nor the manufacturers interested attempt to deny that the program is not up to schedule.

At the present time the outlook promises achievement of our airplane schedule within another ninety days and that delay seems to be the only serious difficulty. The reason for the delay can be ascribed directly to a confusion of priorities during the past winter and to an exaggerated idea of our abilities. The Liberty airplane engine itself is displaying speed and power superior to any engine developed by the Allies or our enemies. The recent investigations and the present investigations of aircraft conditions in this country are not contrary to general opinion directed against either Howard E. Coffin or the aircraft production board as a whole.

**Board Advisory Only**

The aircraft production board, of which Howard Coffin is chairman, is really only an advisory organization. The laws incorporating it specifically state that the board must not duplicate any office or organization now existing in military or naval services. Therefore, although contrary to the public impression, actual production, inspection, accounting and contracting as regards airplanes for our military establishment resides in the hands of the signal corps, and if any one or any department is being investigated it is the signal corps with its commanding officer, General Squier.

Fifty Liberty airplane engines were completed this last week, according to authoritative statements made here to-day, and nearly one hundred Liberty airplane engines would be completed by the end of this present week. The highest authority is responsible for the statement that the Ford Motor Co., which has a program calling for production of 100 Liberty airplane engines per day within the next 90 days, will be able to live accurately up to its schedule. Despite the many hundreds of obstacles in the way to speedy production of this intricate engine, a Ford official has made the statement that the company is even up with its tooling program. At present the Packard company is producing practically all of the Liberty airplane engines. The Lincoln Motors Co. will be ready within 60 days. Their original schedule called for beginning of production April 1.

The three General Motor plants, it is expected, will be in production within the next 30 to 40 days. In other words, all of the companies are rapidly approaching that state which they should have attained from 60 to 90 days sooner, and we should see quantity production of Liberty engines by midsummer.

The aircraft board has for its functions the co-ordination of army and navy flying requirements and operates also as a clearing house for the industrial airplane problems. The real causes for the delay come from the overoptimistic view of manufacturing conditions that was taken a year ago when the airplane program was formed and before we had experienced our fuel shortages, transportation shortages and our difficulties with priorities this last winter, when every company manufacturing war needs demanded priorities, with the result that most industries vital to the war suffered. The aircraft officials frankly admit that they did not conceive of the difficulties of the past winter in their program and that this was the cause of the exaggerated predictions.

With regard to the recent criticisms published throughout the country of the Liberty engine and the airplane program, it can be said that many of these reports were untrue; for example, in the recent report published in New York City, it was stated that the Liberty engine equipped airplane which fell at Mineola suffered the accident because of a broken crankshaft. As a matter of fact, the crankshaft was bent as a result of the fall and was not the cause of it. It is on view in Washington and is the proof in itself of the falsity of the report. The real reason for the accident with this plane is well known in military circles. It is one that does not reflect in any way on the Liberty airplane engine, but which cannot be told here because of objection by the military authorities. The report stating that a Bristol plane equipped with a Liberty engine refused to leave the ground at the Curtiss plant at Buffalo did not tell the complete story. It failed to include the fact that minor mechanical trouble, such as is often found in a new automobile or motor truck, was the cause of the difficulty and that this was remedied and that this Bristol airplane flew perfectly and is now giving excellent service.

The reports have also dwelt with inefficiency, so-called, at the factories of the Curtiss Aeroplane Co. The report stated that the Curtiss had failed to produce a single battleplane up to this time and that it was producing bombing planes very slowly. It added that the Curtiss was 74 per cent behind its schedule. Authoritative statements have been made in answer to these charges, which state that the Curtiss company is not behind its schedule. When the company, taken over by the Willys-Overland Co., negotiated with the government, it was told to make training planes only, as those were most urgently needed. It entered into training plane engine tooling and production. During the month of March more than 1,100 training planes have been turned out by the Curtiss and Willys-Overland organizations. The company has also produced a number of bombing planes, but these have not been finished because the engineers of the signal corps, according to company officials, have not yet designed the bombing attachments. The company states that it is ready to produce fighting planes as soon as it gets government contracts for them.

Snowden Marshall's committee is visiting Buffalo this week and is making a thorough investigation of the Curtiss plant.

Major General Leonard Wood, before the Senate military affairs committee, stated that we should use the foreign motors in our planes because they have been tried and proven, and criticized the Liberty airplane engine. Investigations here failed to reveal any specific knowledge that Major General Wood has about the Liberty engine other than he secured abroad. No great importance has been attached to his statements.

**22,000 Planes Included**

The conference developed many other important and interesting facts. It was shown that 22,000 airplanes are included in our program, of which 7,000 will be training planes, 11,000 will be made here of three types, including the Bristol machine, which is a two-seater, fast and light, carrying machine guns and photographic equipment, but no bombing apparatus; the Day bomber, which is a sort of general purpose machine, similar to the Haviland type used by England and which carries machine guns, bombing apparatus, photographic equipment and is used for fighting and scouting both; the night bomber, capable of carrying heavy loads of explosives and somewhat similar to the huge Caproni, with more than one engine, and used principally for making night raids. The remaining 5,000 planes in the program are those ordered from France and Italy last August, to be furnished directly to our soldiers at the front. Italy, owing to the great German offensive, has been unable to live up to its program, and the schedule for this 5,000 has fallen somewhat behind.

The greatest problem we will have, according to Howard E. Coffin, will be the question of shipping tonnage. One airplane with its spares requires two crates 7 by 8 by 40 feet long each, and it is questionable that the shipping tonnage will be available when quantity production begins. The French government, when we entered the war, suggested that we build no airplanes on this side, but provide the materials and workers to France and England instead. Reports here indicate that this has been done to a surprising extent and that many thousands of our men are workink at allied factories.

The aircraft board states that there is no trouble at this time either with materials as regards quantities or with labor, although it is very likely that in the near future when quantity production is reached there will be a shortage of highly skilled workers.

# French Alcohol Cars

## After War Government Plans to Release 22,000,000 gal. for Motors

### Its Use with Benzol Has Proved Successful

PARIS, March 4—Immediately after the war it is the intention of the French government to put on the market, for the use of motor cars only, a quantity of not less than 22,000,000 gal. of alcohol. This cannot be used alone in the present type of internal combustion engine, and as there is no desire to change the engine to absorb the new fuel, suitable mixtures will have to be made with this alcohol. It is estimated that after the war there will be available a total quantity of 15,000,000 gal. of benzol. The dyeing industries and perfumery makers will require 3,500,000 of this, leaving 11,500,000 available for motor car use.

**Fifty-fifty in Use**

A mixture of 50 per cent alcohol and 50 per cent benzol is suitable for engines as they exist at present, with no other changes than slight modifications to the carbureter. The General Omnibus Co. of Paris made use of this mixture for two years with very satisfactory results, only abandoning it owing to the fluctuations in the price of alcohol. On a 50 per cent mixture the supply of benzol will not be sufficient to absorb all the alcohol available, and it is impossible to mix the alcohol with gasoline owing to the fact that alcohol is not soluble in gasoline. If the two were used together the gasoline would be used up first, leaving a fluid too rich in alcohol to be suitable for the carbureter. The Paris Compagnie Générale des Voitures, which controls most of the taxicabs of Paris, has discovered, however, that a very suitable mixture can be obtained by 50 per cent alcohol, 25 per cent benzol and 25 per cent gasoline. The benzol will dissolve both the alcohol and the gasoline, making a homogeneous mixture. On this basis the whole of the 22,000,000 gal. of alcohol which could not be absorbed completely, owing to the limited supply of benzol, can be made use of in present type engines.

Before the war France imported 66,000,000 gal. of gasoline, most of this coming from America. It is estimated that the quantity required during the first year of peace will be 132,000,000 gal., and as the great increase in the use of motor cars in America makes a further supply from the United States somewhat doubtful, the authorities are seeking as far as possible to assure a home supply. There is practically an unlimited supply of alcohol available from France and the French colonies, but as is well known this fuel cannot be used alone without important modifications in the present type of engine, and it cannot be mixed with gasoline. This reduces the French to a mixture of alcohol and benzol, which is already well known and was used to quite a considerable extent before the war.

Under the government plan, which consists of a state monopoly of alcohol, steady prices will be assured and important users of motor cars will be induced to adopt this fuel. As a compensation and as a steadying influence against variations in the supply of alcohol produced from beets, synthetic alcohol now is being produced by the calcium carbide factories in the Alps and other mountainous districts of France. By reason of the war these factories have been obliged to enlarge to an enormous degree, and although not able at the present time to produce synthetic alcohol in any great quantities, they would be in position to produce it under very economical conditions on the return of peace.

Before the war France produced comparatively little benzol, and although this fuel was used exclusively by Paris taxicabs, most of it was imported from Germany and from England. Since 1914 the gas companies have been obliged to extract the benzol from the coal treated by them. This extraction reduces the calorific quality of the gas, but not, however, to a very serious degree. It is not thought that the government will allow the benzol to be left in the gas immediately peace conditions return. Supposing only 20 grams of benzol per cubic meter are withdrawn, there will still be a total supply in France of 15,000,000 gal.

### NOT THE CAR MAKER

Chicago, March 25—Peter E. Studebaker, president of the International India Rubber Corp., a new tire concern, announced to have started operation in South Bend, has no connection with the Studebaker Corp. It is understood that Peter E. Studebaker formerly was connected with a garage at Covington, Ky.

### GRAY & DAVIS CLEAR DEBTS

Boston, March 25—Gray & Davis, Inc., which went into the hands of a creditors' committee Nov. 24, 1916, paid off its last claim Saturday and to-day is free and clear and doing a good business. The total debts to banks and merchandise creditors when the committee was named amounted to $2,550,000. It was paid in twelve equal payments. The period of payment covered only sixteen months. While the company is devoting a good part of its facilities to munitions work the starter and lamp business is still maintained and last year amounted to $2,500,000.

### REBATE FOR SHOW ASSURED

Chicago, March 25—That the exchanged car show which opens at the Coliseum Saturday morning will be a success from the show promotion standpoint is attested by the report made to-day that $18,095 has been realized from the sale of space, making a profit of $4,000 which will be rebated to the members of the Chicago Automobile Trade Association who are exhibiting. It is anticipated that ticket sales will bring this rebate up to about $8,000.

The technical committee which examines the exchanged car before it is permitted to exhibit has passed 341 cars, totaling in value $348,000. Fifty-eight cars have been rejected, either because they did not come up to the requisite condition mechanically or because the price on them was too high.

# 3800 Lyons Exhibitors

## French Fair Opens with 186 More Displays This Year Than Last

### Motor Cars Feature Third Annual Exhibition

LYONS, France, March 4—The city of Lyons opened its third annual trade fair this week with 3,800 exhibitors, compared with 2,614 in 1917. The Lyons fair was inaugurated in direct rivalry to the one at Leipzig and has been so successful that it is doubtful if the German exhibition will ever regain its importance. It is claimed that the last year the value of the business transacted at Lyons exceeded $40,000,000, this being done under adverse conditions of weather and with transport congested to a very serious degree.

The outstanding feature of this year's fair is the motor car participation. Two years ago there were no motor car makers in the Lyons show. Last year the French Syndicate of Automobile Manufacturers officially boycotted the fair by sending an intimation to all its members that they must not take part in that event. The great majority accepted this advice as an order, although Lyons motor car manufacturers refused to be dictated to. The result was that only local firms, such as Berliet, Rochet-Schneider, Luc Court, Zenith, etc., and agents for American cars held stands at the fair. This year the French syndicate has adopted an entirely different policy, for not only are 200 manufacturers exhibiting, but the syndicate has its own hall, and it has sent down its general secretary, Henry Cezanne, who was general manager of all the later Paris motor car salons, to be chief commissioner of the motor section of the Lyons fair. This indicates a desire on the part of the whole French motor car industry to prepare as early as possible for after-the-war conditions. It is also an abandonment of the narrow policy of jealousy which sought to kill all other exhibits than the one in the Grand Palais, Paris, and which obviously cannot be held again until after the war.

As an indication of the permanent success of the Lyons fair it has been decided to build a permanent building to cost not less than $5,000,000, capable of holding 5000 exhibitors, and having an area of 143,000 sq. yd. Plans of this hall have been prepared and constructive work will begin soon.

### CONSIDER UNIVERSAL FUEL POOL

Washington, March 23—The Fuel Administration is considering pooling of the Nation's pipe line system and pooling of fuel oil to meet the essential needs of the Government and industries. Tank cars are being diverted from the Middle West to the Southeast to relieve the stringency created by withdrawal of tank steamers. Companies now supplying "non-essential" consumers with fuel oil will be called to help supply needs in the emergency.

# Ordnance Department Motors

## Equipment of Tractors, Trailers and Motor Trucks with Their Make-up and Work

WASHINGTON, March 25—Special telegram—The Ordnance Department, greatly expanded by the war urgencies, has developed a tremendous equipment of tractors, trailers and motor trucks to augment the military establishment. Forty-eight new 4-ton trailers have just been completed in design that will each carry complete equipment for making various repairs in the field and behind the lines. These soon will soon be in process of production.

Special schools have been established at the Rock Island arsenal for equipment repairs, motor equipment repairs at Peoria, Ill., and supply work at several arsenals. Many of the commissioned and the enlisted personnel are having instruction at these schools, and in addition field artillery officers have been sent to acquire knowledge of motor equipment care to provide for emergencies that may arise in active duty.

There are eight heavy artillery mobile repair shops to an army, each consisting of two sections capable of independent operation, the general function being to make moderate repairs to heavy artillery and its motor equipment. Each section is composed of a repair and a supply organization. The sub-section, devoted to repair, is made of three 3-ton trucks of the repair type called toolroom trucks, air-compressor trucks and forge trucks, and five 4-ton trailers of the machine shop type called generator, lathe, welding set, drill press and shapes and milling machine trailers. A 4-ton crane trailer and a motorcycle with sidecar also are provided.

### Supply Sub-Section

The supply sub-section contains six-4-ton trailers of the supply parts type, which are completely housed and provided with bins of various sizes similar to those in a stock room, six 3-ton trucks of the repair type for carrying large assemblies; two motorcycles with sidecars, one solo motorcycle and one 1-ton delivery truck.

A complete section further is provided with one 4-ton trailer with machine shop body and two 3-ton trucks with repair body for transporting baggage; one 3-ton truck with repair body slightly altered and equipped with desks, files, etc., which is used as an office; one 3-ton truck of the ammunition type for carrying fuel in drums; one touring car and one rolling kitchen of the trail mobile type.

Each shop is commanded by a major assisted by one second lieutenant as adjutant. The commissioned personnel assigned to one-section is one captain commanding, one first lieutenant in direct charge of the repair sub-section, records and files.

The enlisted personnel, totalling 103, are of various grades from ordnance sergeant to private, acting in capacities of expert machinists, electricians, inspectors, mechanics, ignition and carbureter experts, blacksmiths, welders, assemblers, testers, chauffeurs, stock keepers, helpers, etc.

For traveling purposes each of the twelve trucks of the repair type hauls a 4-ton trailer and the tank truck, the rolling kitchen, leaving the light delivery truck free for general purposes, the motorcycles being employed for dispatch and agent service.

In the general scheme of operation the vehicles are parked to occupy three sides of a rectangle, leaving an end open for entrance of repair jobs. The supply and spare parts trucks and trailers usually occupy one side, the power and machine tool trucks and trailers the other, leaving one end for the officer and delivery trucks with motorcycles and passenger cars. The personnel are quartered under canvas or such shelter as the commanding officer may direct constructed.

The trailers may be jacked up and propped with wood blocks for leveling, if the ground is too soft for machine operations on the wheels.

The generator trailers contain two 15-kw. D C generators, each being directly connected to a separate gasoline engine in order that one set may be overhauled without shutting down. A three-wire system is employed, giving a total output of 30 kw. for power and lighting.

The air compressor is directly connected with a 40-hp. gasoline engine identical with that installed in the trucks and compressor gage. A 100-ft. armored hose of 1-in. diameter is provided to deliver air to the appropriate hammers, chippers, etc.

The lathe trailer contains an 18-in. lathe with an overhead trolley chain hoist to handle heavy jobs.

The forge truck contains a large portable forge, anvil, rivet furnace and a complete set of blacksmith's tools.

The toolroom truck contains a 9-in. lathe, a bench drill, a combination cutter and drill grinder and a complete outfit of small tools.

The welding set trailer is completely fitted with apparatus for oxy-acetylene welding, with a low pressure acetylene generator of large capacity.

The drill press trailer contains a 21-in. drill press and a shaper, with complete tool equipment.

The milling machine trailer contains a 9-in. lathe, a precision lathe, a milling machine and a sensitive drill press and optical repair chest for the repair and parts replacement of optical instruments.

The standard ordnance motor vehicles are as follows: The ammunition truck consists of a steel body mounted on a four-wheel drive type of truck chassis. The body is designed to accommodate original packing boxes of any type of ammunition. This body also will carry five 55-gal. steel tanks for gasoline, oil and water supply. In general it is intended to use this body wherever an ordnance truck is required for heavy cargo purposes. The equipment repair truck consists of a repair body mounted on a four-wheel-drive type of truck chassis. The body is fitted with bins and chests of drawers of spare parts and raw material for repairing personal equipment, machine guns, pistols, rifles, leather equipment, etc. Machines for sewing leather and canvas, work benches, etc., are supplied with the necessary hand tools for making repairs.

The artillery repair truck consists of a small machine shop repair body mounted on a four-wheel-drive type of truck chassis and constitutes a small repair shop. The equipment consists of a lathe, drill press, bench grinder, portable electric drill, oxy-acetylene welding outfit, air-riveting hammer, milling attachment, blacksmith outfit and an assortment of the necessary tools to repair artillery material and motor vehicles. Electric power is supplied by a small gasoline-driven generator mounted on the truck. It is intended to use this truck with possible minor variations in equipment wherever the service of such a vehicle is necessary. This truck ordinarily is accompanied by an artillery supply truck carrying tools, spare parts, raw material, bar stock, etc., for use in connection with such repairs.

### Takes Place of Horse

The artillery supply truck in motorized batteries takes the place, and carries the equipment of the battery and store wagons, of what was formerly horse-drawn field artillery. The equipment consists of tools, spare parts, etc., pertaining to the particular type of cannon to which assigned. This vehicle is also used as a companion truck to the artillery repair truck wherever it may be used for carrying spare parts, material, etc.

The artillery tractor, 2½ ton, weighing about 5000 lb. and capable of crossing bad ground at a speed of 10 m.p.h., developing about 12 m.p.h. under favorable road conditions, will be provided for handling the reel and cart attached to the battalion and regimental headquarters of motorized artillery regiments in place of the six-horse team used in horsed regiments.

The artillery tractor 5-ton, weighing about 9000 lb. and having speeds of 1½, 3 and 6 m.p.h. respectively, is intended for use with 4.7-in. gun and 6-in. howitzer material, each tractor hauling half a section or for loads not exceeding 10,000 lb.

The artillery tractor 10-ton, weighing about 17,000 lb., and having a low speed of about 1½ m.p.h. and capable of developing 4½ m.p.h., or a little better on high speed, is intended for use in motorized regiments of 6-in. guns or for loads weighing up to 18,000 lb., such as a large howitzer broken up into smaller units for transportation.

The artillery tractor, 15-ton, weighing 26,000 lb., and having speeds of 2⅛ and 3½ m.p.h., and the artillery tractor, 120-hp., weight about 28,000 lb. and having

speeds of 2⅛ and 3½ m.p.h., will be supplied in limited numbers. These tractors are of the track-laying type, similar to those used by the French and British governments and are for handling heavy loads which are not subdivided for transportation.

The reel and fire control truck consists of a four-wheel-drive truck chassis, having the rear wheels replaced by creeping tracks, to improve the ability to negotiate bad ground, and a wire reel, mounted on the rear end of the truck. Between the reel and driver's seat are chests for carrying fire control instruments, on which several men may also sit. This vehicle will have a speed of 12 m.p.h. or better.

The reconnaissance car consists of a 1-ton rear-drive type of chassis having mounted upon it a steel body suitable for carrying from twelve to fourteen men with necessary storage space for fire control instruments. This car is capable of developing from 30 to 40 m.p.h. under full load.

The light repair truck, weighing about 2400 lb., consists of a small box body mounted on a light chassis. It carries chests containing carpenters' and mechanics' hand tools, motor car tools and supplies, lubricants and greases, and is used for light emergency repairing and general utility work.

**Anti-Aircraft Trailers**

The 1½-ton anti-aircraft trailer model is to transport the 75-mm. improvised anti-aircraft gun. Two trailers are used to transport each piece, one carrying the gun, and cradle and the other the gun platform.

The 3-ton antiaircraft gun trailer weighing about 4200 lb., is designed to have permanently mounted upon it a 75-mm. anti-aircraft gun. This trailer also carries a box containing ammunition.

The 3-in. field gun trailer, weighing about 4400 lb., is so designed that 3-in. gun material and similar vehicles may be easily loaded upon it and transported at high speed behind motor trucks. After the guns are placed, the trailers will be available for bringing up ammunition, provided road conditions are favorable enough for their use.

Other trailers of various types are furnished for special purposes which vary from those carrying corps repair shop equipment to those of sufficient capacity to transport tractors and tanks and damaged vehicles at high speed on good roads.

Tanks and other armored land vehicles are designed to be procured and maintained by the Ordnance Department.

While the Ordnance Department has probably had to design a greater variety and handle a greater volume of motor equipment than any other department of the Government, there has been a continuous and successful effort to keep the variety of vehicles and parts to the absolute minimum consistent with the necessities of the service and, unless absolutely impractical to do so, to use parts already in service in France or used by some other branch of the Government.

For example, only one size of tire is used on all the heavier trucks and trailers, and this size also is used on similar vehicles by the Quartermaster Corps, Signal Corps and Engineers. One size of tractor uses in its engine practically every part of the B engine used by the Quartermaster Corps. The same magneto is used on all ordnance vehicles and in emergency is readily replaceable with the magnetos used by other departments. Four sizes of standard tractors have been developed and adopted to meet the needs of the artillery service, and these tractors, when required by any other branch of the army, will be supplied by the Ordnance Department to reduce the number of types. All the types of the ordnance truck bodies are interchangeable on all truck chassis issued to the artillery, to facilitate changes in the field. Numerous other examples could be mentioned of the effort to keep parts to a minimum and effect co-operation between the departments of the Government.

# Tractor Makers Unite

## Twenty-six Companies Form National Conference at Meeting in Chicago

### Few of Large Concerns Are Represented

CHICAGO, March 22—Just what the real purpose is which lies behind the organization of the National Conference of Tractor Manufacturers which was perfected at a meeting held last week at the Congress Hotel is exciting the interest of those tractor manufacturers who were invited to attend the conference but who were not represented. This includes practically all the more important of the tractor manufacturers of the country and nearly all the members of the National Tractor Manufacturers' Association, now a subsidiary department of the National Implement and Vehicle Association. As a matter of fact, few of the tractor companies which have a production of sufficient size to be of any consequence in the tractor trade at the present time were represented at the meeting. Twenty-six companies were represented:

The Peoria Tractor Corp., Peoria, Ill.; Stinson Tractor Co., Minneapolis; Beeman Garden Tractor Co., Minneapolis; Gilson Mfg. Co., Port Washington, Wis.; Strite Tractor Co., New York; Gile Tractor & Engine Co., Ludington, Mich.

Acme Harvesting Machine Co., Peoria, Ill.; National Tractor Co., Chicago; the John Lauson Mfg. Co., New Holstein, Wis.; Interstate Tractor Co., Waterloo, Iowa; Appleton Mfg. Co., Batavia, Ill.

Common Sense Gas Tractor Co., Minneapolis; Leonard Tractor Co., Jackson, Mich.; Topp-Stewart Tractor Co., Clintonville, Wis.; Lang Tractor Co., Minneapolis; Reed Foundry & Machine Co., Kalamazoo, Mich.

Square Turn Tractor Co., Chicago; Elgin Tractor Corp., Piqua, Ohio; New Age Tractor Co., Minneapolis; Wayne Tractor Co., Detroit; Illinois Silo & Tractor Co., Bloomington, Ill.; F. C. Austin Co., Inc., Chicago; Gray Tractor Co., Inc., Minneapolis; Leader Tractor Co., Des Moines; Andrews Tractor Co., Minneapolis; Evans Mfg. Co., Hudson, Ohio.

The ostensible purpose of the conference, as outlined by Chairman D. F. Carmichiel of the New Age Tractor Co., Minneapolis, was the organization of an association which should work for the elimination of some of the unfair practices which have grown up in the trade, to stabilize the business of building tractors, to provide an organization in which every concern shall have the right to a free expression of opinion and which shall not be dominated by a single personality or policy, to gather statistics regarding the tractor industry to be presented to the Government in substantiation of the claim that the tractor industry is an essential one and therefore is entitled to preferential treatment. Also to enlist, if possible, the unanimous efforts of the tractor industry of the country to work co-operatively with the agricultural department and the food commission to the end that the tractor industry may be stimulated and sustained and the food productive capacities of the country increased.

Essentially these purposes are embodied in a resolution introduced by G. S. Albaugh of the Square Turn Tractor Co., Chicago, and which also provides for the appointment of a tractor war service committee which shall work co-operatively with the Government. This committee is composed of the following company representatives:

James R. Collins, Peoria; D. F. Charmichiel, Minneapolis; A. Violette, Detroit; W. R. Gleeson, Minneapolis; H. D. Lauson, New Holstein, Wis.; G. S. Albaugh, Chicago; F. R. Beeman, Minneapolis; F. H. Cozzens, New York; J. M. Robinson, Peoria; John Hurlbut, Detroit; D. Fitchian, Waterloo, Iowa; R. T. Evans, Hudson, Ohio, and H. W. Adams, Minneapolis.

Behind this, however, is the hope and the purpose to influence the Government, through the essential argument, to finance the building and the distribution of tractors. This idea was conceived first by A. Violette of the Wayne Tractor Co., Detroit, who called a conference of tractor manufacturers which met at Washington March 2. This was followed by another meeting at New York, at which time it was decided to call the Chicago meeting. It was openly avowed by many of the speakers at the conference that the hope of inducing the Government to finance tractor manufacture was entertained and that the reason for holding the conference at this time was to get the work of gathering the material to establish the essential nature of the industry under way, so that when certain legislation now pending should be passed and certain monies made available by that legislation some of it might be devoted to this purpose. This seems to be the real reason behind the conference, however much the other purposes avowed may interest the manufacturers.

The direction of the future conduct of the national conference was entrusted to an executive board composed as follows: D. F. Carmichiel, Minneapolis, chairman; F. H. Cozzens, New York, vice-chairman; W. B. Gleeson, Minneapolis, secretary; G. S. Albaugh, Chicago, treasurer, and A. Violette, Detroit.

## MORE CONTRACTS LET

Washington, March 25—Special telegram—Following is a list of contracts made by the Quartermaster Department since March 12: March 12, Continental Car Co. of America, Louisville, Ky., body-mounting sills; Brown-Lipe-Chapin Co., Syracuse, N. Y., differentials; March 13, Prudden Wheel Co., wood wheels; Bimel Spoke & Auto Wheel Co., wood wheels; March 15, Edward G. Budd Mfg. Co., body-mounting sills and hardware for class B trucks; Gramm-Bernstein Motor Truck Co., body-mounting sills.

# 4,941,276 Cars and Trucks Registered

## *First War Year Shows Gain of* 1,396,324

A TOTAL gain of 1,396,324 motor cars and trucks was made in the United States during 1917 over 1916. That the motor car is a necessity in wartime as well as in peace times could be demonstrated better in no other way. The total motor car and truck registration in the country as of Jan. 1, 1918, as based on official figures compiled by the Automotive Industries from all the forty-eight states, is 4,941,276. Nor does this include duplicate registrations or even the hundreds and perhaps thousands of car in remote districts, all of which are not registered.

In round figures there must have been mighty close to 5,000,000 cars and trucks in the United States on the first day of 1918.

One motor vehicle for every twenty inhabitants of the country—think of it. A year ago there was one for every twenty-nine; two years ago, one for every forty-two. The gains during the last three years are:

1915 registration gain..... 686,998
1916 registration gain.....1,070,143
1917 registration gain.....1,396,324

The estimated output of cars and trucks in 1917 was 1,938,778. Compare this with the increase in registration of 1,396,324. Do not think, however, that 542,000, the difference between the figures, went out of commission during the year. Part of the difference is due to cars produced during the last three months of 1917 and stored by makers and dealers for spring delivery.

Sixteen states have registered more than 100,000 vehicles. Oklahoma gained special distinction last year by increasing its registrations 47,481 and entering the 100,000 and more class. A gain of 90 per cent over the previous year nearly doubled its registration in twelve months.

A year ago only five states boasted registration of more than 200,000 cars each. These were New York, Ohio, Illinois, California and Pennsylvania. Three recruits have been made—Iowa, Michigan and Texas.

A year ago not a state had reached the 300,000 registration mark. To-day New York, Illinois, Ohio and Pennsylvania are in this class. Their additions were:

New York ..... .124,841
Illinois ..... 88,992
Ohio ..... 81,451
Pennsylvania ..... 94,505

New York is still premier with a registration of more than 400,000. The official figure, as of Jan. 1, 1918, is 404,247.

In actual gains in registration New York leads, followed by Iowa, which has taken the leadership away from such great central states as Illinois, Ohio, Pennsylvania and Michigan.

**Big Gains in South**

Very high percentages of gains were shown by a group of states that includes Florida, South Carolina, Arkansas, Idaho, Montana, Arizona, Wyoming, New Mexico and Maryland and the District of Columbia. Florida's gain ran 176 per cent. Twice as many cars were sold in the state last year as there were cars in the state formerly. South Carolina almost doubled its car population, as did Arkansas and Oklahoma.

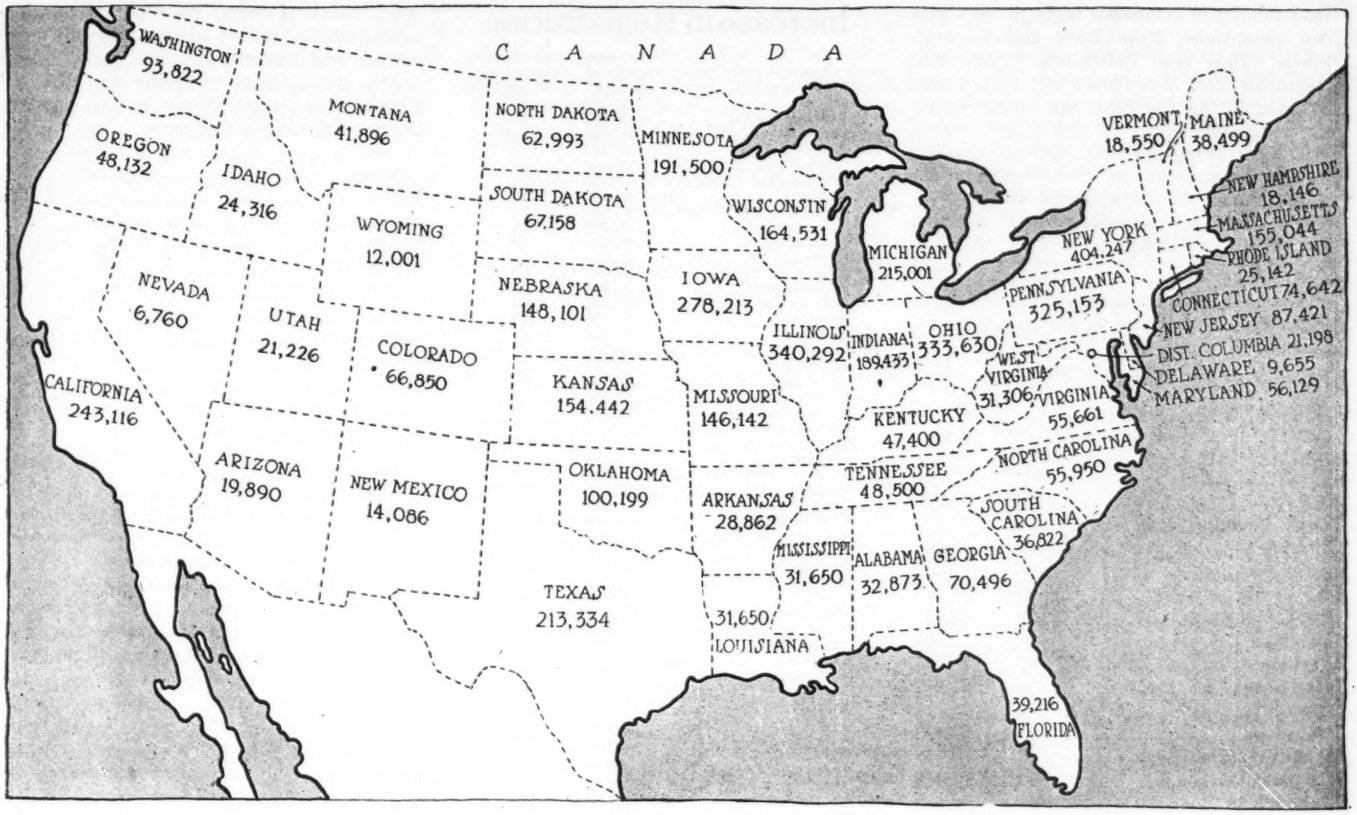
Notwithstanding these phenomenal gains the big substantial gains that made up the 1,396,324 increase for the whole country are found in the great agricultural states, with the possible exception of New York. Here are a few examples:

Iowa gained .....105,422
Illinois ..... 88,992
Ohio ..... 81,451
Michigan ..... 55,362
Minnesota ..... 54,000
Indiana ..... 50,295
Oklahoma ..... 47,481
Wisconsin ..... 46,928
Nebraska ..... 46,900
Kansas ..... 40,078
Missouri ..... 38,277
Washington ..... 31,276

The total increased registrations in this dozen of the leading grain-growing states amounts to nearly 700,000. These states

### Cars and Trucks Registered Jan. 1 for Four Years and Present Population

| | 1915 | 1916 | 1917 | 1918 | Pop. July 1, 1917 Census | Pop. per Car Jan. 1, 1918 |
|---|---|---|---|---|---|---|
| Alabama | 8,425 | 13,798 | 22,354 | 32,873 | 2,363,939 | 72 |
| Arizona | 4,774 | 7,320 | 12,122 | 19,890 | 263,788 | 13 |
| Arkansas | 5,642 | 8,021 | 14,704 | 28,682 | 1,766,343 | 61 |
| California | 123,101 | 163,801 | 212,918 | 243,116 | 3,029,032 | 12 |
| Colorado | 17,951 | 26,611 | 44,180 | 66,850 | 988,320 | 15 |
| Connecticut | 26,218 | 38,950 | 56,048 | 74,642 | 1,265,373 | 17 |
| Delaware | 2,894 | 4,924 | 7,520 | 9,655 | 215,160 | 22 |
| District of Columbia | 8,000 | 10,200 | 13,118 | 21,198 | 369,282 | 17 |
| Florida | 11,366 | 13,123 | 14,220 | 39,216 | 916,185 | 23 |
| Georgia | 20,800 | 24,059 | 45,775 | 70,496 | 2,895,841 | 40 |
| Idaho | 3,272 | 7,093 | 12,996 | 24,316 | 445,176 | 18 |
| Illinois | 131,140 | 182,290 | 251,300 | 340,292 | 6,234,995 | 18 |
| Indiana | 65,500 | 96,915 | 139,138 | 189,433 | 2,835,492 | 15 |
| Iowa | 106,087 | 139,808 | 172,791 | 278,213 | 2,224,771 | 8 |
| Kansas | 50,467 | 74,956 | 114,364 | 154,442 | 1,851,870 | 12 |
| Kentucky | 11,746 | 19,500 | 31,500 | 47,400 | 2,394,093 | 50 |
| Louisiana | 3,500 | 10,880 | 20,014 | 31,650 | 1,856,954 | 58 |
| Maine | 14,300 | 18,600 | 28,951 | 38,499 | 777,340 | 20 |
| Maryland | 20,213 | 27,638 | 33,364 | 56,129 | 1,373,673 | 24 |
| Massachusetts | 76,832 | 89,133 | 136,790 | 155,044 | 3,773,973 | 24 |
| Michigan | 76,389 | 114,845 | 159,639 | 215,001 | 3,094,266 | 14 |
| Minnesota | 67,365 | 91,829 | 137,500 | 191,500 | 2,312,445 | 12 |
| Mississippi | 3,894 | 11,500 | 20,474 | 31,650 | 1,976,570 | 62 |
| Missouri | 50,998 | 76,462 | 107,865 | 146,142 | 3,429,595 | 23 |
| Montana | 10,706 | 14,520 | 24,585 | 41,896 | 472,935 | 11 |
| Nebraska | 50,000 | 59,140 | 101,201 | 148,101 | 1,284,771 | 8 |
| Nevada | 1,487 | 2,177 | 4,609 | 6,760 | 110,738 | 17 |
| New Hampshire | 8,738 | 10,819 | 14,338 | 18,146 | 444,429 | 24 |
| New Jersey | 58,820 | 67,556 | 75,108 | 87,421 | 3,014,194 | 34 |
| New Mexico | 3,090 | 4,947 | 8,028 | 14,086 | 423,649 | 30 |
| New York | 156,173 | 212,844 | 279,406 | 404,247 | 10,460,182 | 25 |
| North Carolina | 14,815 | 21,160 | 35,150 | 55,950 | 2,434,381 | 43 |
| North Dakota | 17,348 | 24,678 | 41,761 | 62,993 | 765,319 | 12 |
| Ohio | 121,265 | 179,767 | 252,179 | 333,630 | 5,212,085 | 15 |
| Oklahoma | 7,360 | 25,615 | 52,718 | 100,199 | 2,289,855 | 22 |
| Oregon | 16,347 | 23,758 | 30,917 | 48,132 | 861,992 | 18 |
| Pennsylvania | 107,141 | 150,729 | 230,648 | 325,153 | 8,660,042 | 26 |
| Rhode Island | 12,331 | 16,362 | 21,406 | 25,142 | 625,865 | 24 |
| South Carolina | 15,000 | 14,500 | 19,000 | 36,822 | 1,643,205 | 44 |
| South Dakota | 20,080 | 29,336 | 44,271 | 67,158 | 716,972 | 10 |
| Tennessee | 19,668 | 27,266 | 31,400 | 48,500 | 2,304,629 | 47 |
| Texas | 64,732 | 90,000 | 197,687 | 213,334 | 4,515,423 | 24 |
| Utah | 6,139 | 7,994 | 13,507 | 21,226 | 443,866 | 20 |
| Vermont | 7,613 | 11,499 | 14,251 | 18,550 | 364,946 | 19 |
| Virginia | 13,985 | 21,357 | 35,426 | 55,661 | 2,213,025 | 39 |
| Washington | 30,523 | 36,905 | 62,546 | 93,822 | 1,597,400 | 17 |
| West Virginia | 7,217 | 13,256 | 20,437 | 31,306 | 1,412,602 | 45 |
| Wisconsin | 53,180 | 81,371 | 117,603 | 164,531 | 2,527,167 | 15 |
| Wyoming | 2,428 | 3,976 | 7,125 | 12,001 | 184,970 | 15 |
| | 1,754,570 | 2,423,788 | 3,544,952 | 4,941,276 | 103,640,473 | 21 |




*Registration of passenger cars and trucks in the United States segregated by states*

# Car and Truck Registrations in United States to Jan. 1, 1918

| State or Territory | Total Registration | New Registration | Registration Up to Jan. 1, 1917 | Gasoline Passenger Cars in Use | Electric Passenger Cars in Use | Gasoline Commercial Cars in Use | Electric Commercial Cars in Use | Motorcycles in Use | Non-Resident Registration* | Re-registered** | Chauffeurs Registered | Total Fees | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Alabama | 32,873 | 10,519 | 22,354 | ..... | ..... | ..... | ..... | 1,240 | ..... | ..... | 1,631 | $ 187,696 | |
| Arizona | 19,890 | 7,768 | 12,122 | ..... | ..... | 1,439 | ..... | 868 | ..... | ..... | 3,453 | 117,643 | |
| Arkansas | 28,862 | 14,158 | 14,704 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 485 | ..... | |
| California | 245,866 | 32,948 | 212,918 | 245,866 | ..... | 10,765 | ..... | 32,489 | 2,750 | None | 14,953 | 2,846,030 | |
| Colorado | 66,850 | 22,670 | 44,180 | ..... | ..... | ..... | ..... | 4,504 | ..... | ..... | ..... | ..... | |
| Connecticut | 74,642 | 18,594 | 56,048 | ..... | ..... | 9,702 | ..... | 4,905 | ..... | ..... | ..... | ..... | |
| Delaware | 10,700 | 3,180 | 7,520 | ..... | ..... | ..... | ..... | 730 | ..... | 1,045 | ..... | 133,883 | |
| District of Columbia | 21,198 | 8,080 | 13,118 | 20,939 | 267 | ..... | ..... | 346 | ..... | ..... | 59,800 | 83,110 | |
| Florida | 39,216 | 24,996 | 14,220 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 6,000 | ..... | |
| Georgia | 72,851 | 27,076 | 45,775 | †68,751 | †800 | †3,000 | †100 | 1,400 | 355 | 2,000 | 1,400 | 230,862 | |
| Idaho | 24,716 | 11,720 | 12,996 | ..... | ..... | ..... | ..... | 752 | None | †400 | 1,181 | 413,929 | |
| Illinois | 340,292 | 88,992 | 251,300 | ..... | ..... | ..... | ..... | 13,750 | ..... | ..... | 45,000 | 2,237,545 | |
| Indiana | 192,192 | 53,054 | 139,138 | ..... | ..... | ..... | ..... | 10,315 | ..... | 2,759 | ..... | 1,096,106 | |
| Iowa | 278,213 | 105,422 | 172,791 | ..... | ..... | ..... | ..... | 7,684 | ..... | ..... | None | 2,249,655 | |
| Kansas | 159,342 | 44,978 | 114,364 | ..... | ..... | ..... | ..... | 5,599 | None | 4,900 | None | 83,258 | |
| Kentucky | 47,400 | 15,900 | 31,500 | ..... | ..... | ..... | ..... | 1,450 | ..... | ..... | ..... | 287,212 | |
| Louisiana | 31,650 | 11,636 | 20,014 | ..... | ..... | 3,165 | ..... | 382 | ..... | ..... | ..... | 170,000 | |
| Maine | 41,499 | 12,548 | 28,951 | 38,067 | †50 | 3,382 | None | 1,516 | ..... | 3,000 | ..... | 487,873 | |
| Maryland | 60,943 | 27,579 | 33,364 | 3,051 | ..... | 3,656 | †500 | 5,436 | †1,500 | 3,314 | 15,524 | 807,395 | |
| Massachusetts | 174,274 | 37,484 | 136,790 | ..... | ..... | 26,964 | ..... | ..... | ..... | 19,230 | 51,690 | 1,969,813 | |
| Michigan | 226,693 | 67,054 | 159,639 | 206,380 | ..... | 20,313 | ..... | 8,727 | 306 | 11,386 | 20,157 | 2,476,525 | |
| Minnesota | 192,000 | 54,500 | 137,500 | †170,000 | †500 | †20,000 | †1,500 | 15,000 | None | 500 | †5,000 | 344,000 | Triennial |
| Mississippi | 31,650 | 11,176 | 20,474 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | None | ..... | Perennial |
| Missouri | 151,027 | 43,162 | 107,865 | ..... | ..... | ..... | ..... | 4,179 | ..... | 4,885 | 18,040 | 617,943 | |
| Montana | 42,749 | 18,164 | 24,585 | ..... | ..... | †600 | ..... | 923 | ..... | 853 | 3,056 | 295,207 | |
| Nebraska | 148,101 | 46,900 | 101,201 | ..... | ..... | ..... | ..... | 3,500 | ..... | ..... | None | ..... | |
| Nevada | 6,885 | 2,276 | 4,609 | 6,882 | 3 | †225 | ..... | 238 | None | 125 | ..... | 32,320 | |
| New Hampshire | 22,267 | 7,929 | 14,338 | 22,000 | 100 | ..... | ..... | 2,218 | 1,721 | 2,400 | 8,288 | 425,305 | |
| New Jersey | 141,918 | 66,810 | 75,108 | ..... | ..... | 9,622 | ..... | 13,198 | 28,383 | †26,114 | 177,568 | 1,923,164 | |
| New Mexico | 14,086 | 6,058 | 8,028 | ..... | ..... | ..... | ..... | 345 | ..... | ..... | None | 80,343 | |
| New York | 410,950 | 131,544 | 279,406 | ..... | ..... | 55,402 | ..... | 28,773 | 4,257 | 2,446 | 132,833 | 4,251,991 | |
| North Carolina | 55,950 | 20,800 | 35,150 | ..... | ..... | ..... | ..... | 1,253 | ..... | None | None | 321,923 | |
| North Dakota | 62,993 | 21,232 | 41,761 | ..... | ..... | ..... | ..... | 1,834 | ..... | ..... | ..... | 211,536 | |
| Ohio | 342,630 | 90,451 | 252,179 | ..... | ..... | ..... | ..... | 21,925 | ..... | 9,000 | ..... | 1,766,427 | |
| Oklahoma | 100,199 | 47,481 | 52,718 | ..... | ..... | ..... | ..... | 2,368 | None | ..... | None | 836,400 | |
| Oregon | 48,632 | 17,715 | 30,917 | 44,844 | †100 | 3,648 | †40 | 3,400 | †500 | None | 3,476 | 196,788 | |
| Pennsylvania | 325,153 | 94,505 | 230,648 | ..... | ..... | 12,952 | ..... | 24,567 | ..... | ..... | ..... | 3,268,025 | |
| Rhode Island | 25,142 | 3,736 | 21,406 | ..... | ..... | 4,065 | ..... | 1,133 | ..... | ..... | ..... | 346,117 | |
| South Carolina | 38,322 | 19,322 | 19,000 | ..... | ..... | ..... | ..... | 1,250 | 500 | 1,000 | None | 113,557 | |
| South Dakota | 67,158 | 22,887 | 44,271 | ..... | ..... | ..... | ..... | 1,554 | None | None | None | ..... | |
| Tennessee | 48,500 | 17,100 | 31,400 | ..... | 50 | ..... | 10 | 900 | None | None | None | 317,000 | |
| Texas | †219,721 | 22,034 | 197,687 | ..... | ..... | ..... | ..... | 3,468 | 28 | 6,359 | 12,714 | 858,611 | |
| Utah | 21,576 | 8,069 | 13,507 | 18,227 | 100 | 2,500 | ..... | 1,385 | 100 | †250 | 1,547 | 106,863 | Perennial |
| Vermont | 20,367 | 6,116 | 14,251 | 18,970 | 7 | 1,262 | 4 | 758 | ..... | 1,817 | 3,655 | 362,541 | |
| Virginia | 55,661 | 20,235 | 35,426 | ..... | ..... | ..... | ..... | 2,135 | ..... | ..... | 3,530 | 518,566 | |
| Washington | 93,822 | 31,276 | 62,546 | 82,066 | ..... | 11,656 | ..... | 6,320 | ..... | None | None | 519,526 | |
| West Virginia | 31,306 | 10,869 | 20,437 | ..... | ..... | ..... | ..... | 825 | None | ..... | ..... | ..... | |
| Wisconsin | 164,531 | 46,928 | 117,603 | ..... | ..... | †6,000 | ..... | 8,479 | None | None | None | 861,283 | |
| Wyoming | 12,501 | 5,376 | 7,125 | ..... | ..... | ..... | ..... | 352 | None | 500 | None | 57,400 | |
| Total | 5,085,959 | 1,541,007 | 3,544,952 | 946,043 | 1,977 | 210,318 | 2,154 | 254,373 | 40,400 | 104,283 | 590,963 | $34,501,371 | |

NOTE.—Steam cars and trucks are included with the gasoline vehicle statistics, as segregation is not carried out by registration officials. *Number of care registered owned by citizens of other states. **Number of vehicles re-registered, owing to transfer of ownership, etc. .....Statistics not available. †Estimated by Secretary of State.

head the list of increased registrations with two exceptions, New York and Pennsylvania. They lead California. They lead Massachusetts, that shows but 13 per cent increase during the year, the second smallest percentage gain of the year. Texas, with a percentage gain in registrations of 8 per cent, stands at the foot of the ladder of increases. Western Texas suffered severely from dry weather, which explains this to quite an extent.

**50 Per Cent More**

Increased registrations in the southern states indicate a Solid South in big gains, all running more than 50 per cent, if we overlook Texas and Alabama, the latter with 47 per cent.

The roll of honor is:

| | Per cent gained 1917 | |
|---|---|---|
| Florida | 176 | 24,996 |
| South Carolina | 89 | 17,822 |
| Oklahoma | 90 | 47,481 |
| Arkansas | 96 | 14,158 |
| Maryland | 68 | 22,765 |
| North Carolina | 59 | 20,800 |
| Louisiana | 58 | 11,636 |
| Virginia | 57 | 20,235 |
| Mississippi | 54 | 11,176 |
| Georgia | 54 | 24,721 |
| Tennessee | 54 | 17,100 |
| West Virginia | 53 | 10,869 |
| Kentucky | 50 | 15,900 |
| Alabama | 47 | 10,519 |
| Texas | 7 | 15,647 |
| District of Columbia | 61 | 8,080 |

This represents a total increase of registration in these southern states of 296,779, or scarcely half the gain in the agricultural states previously analyzed. The phenomenal gains give indication of the still greater ability of these southern states to absorb cars and trucks during 1918. With continual prosperity in the South under the stimulation of war it will not be surprising if 1918 shows a registration increase in these states of 500,000. All during the present winter the South has been asking for cars and there have been factory driveaways on a scale never contemplated before. For the first time the South has given indication of its buying strength.

Other groups of states to profit under war regime are the mining and oil states. In this group those states such as Oklahoma which possess the profitable combination of oil and crops as well as live stock give evidence of the increased wealth under war.

In the mining group of Western states, comprising Idaho, Montana, Wyoming, New Mexico, Arizona, Utah, Colorado and Nevada, the gains are very nearly as spectacular as in the solid South. Here the gain percentages run well over 50 with the single exception of Nevada, which, like Alabama in the South, fell below this mark. Idaho gets the leadership, with 87 per cent gain, which is nearly on a par with Oklahoma, which profited so well from oil, agriculture and live stock.

The percentages of gains and the net increases in registrations in this western group of mining states are:

| State | Per cent gained | |
|---|---|---|
| Idaho | 87 | 11,320 |
| New Mexico | 75 | 6,058 |
| Montana | 70 | 17,311 |
| Wyoming | 68 | 4,876 |
| Arizona | 63 | 3,768 |
| Utah | 57 | 7,719 |
| Colorado | 51 | 22,670 |
| Nevada | 47 | 2,151 |
| Total | | 79,793 |

**New England Gain Low**

The six New England states as a unit show very low registration gains over the 1916 calendar year, the percentages all running under 50, in fact, the highest percentage is 33, which honor is shared by Connecticut and Maine, whereas the smallest gain, namely 13 per cent, went to the pioneer motoring state of Massachusetts. The New England gains by states in percentages and actual registrations are:

| State | Per cent gained | |
|---|---|---|
| Maine | 67 | 9,548 |
| Connecticut | 33 | 18,594 |
| New Hampshire | 26 | 3,808 |
| Vermont | 30 | 4,299 |
| Rhode Island | 17 | 3,736 |
| Massachusetts | 13 | 18,254 |
| Total | | 58,239 |

Compared with the calendar year of 1916, the entire New England territory did not show gains in 1917, as might have been expected. The percentages of registration gains in 1916 were much higher. Maine had 55 per cent, Massachusetts had 53 per cent, as compared with 13 per cent last year. The only New England state that showed a bigger percentage increase in 1917 than in 1916 was Vermont, which showed 24 per cent in 1916 and 30 per cent in 1917.

**Falling Off Here**

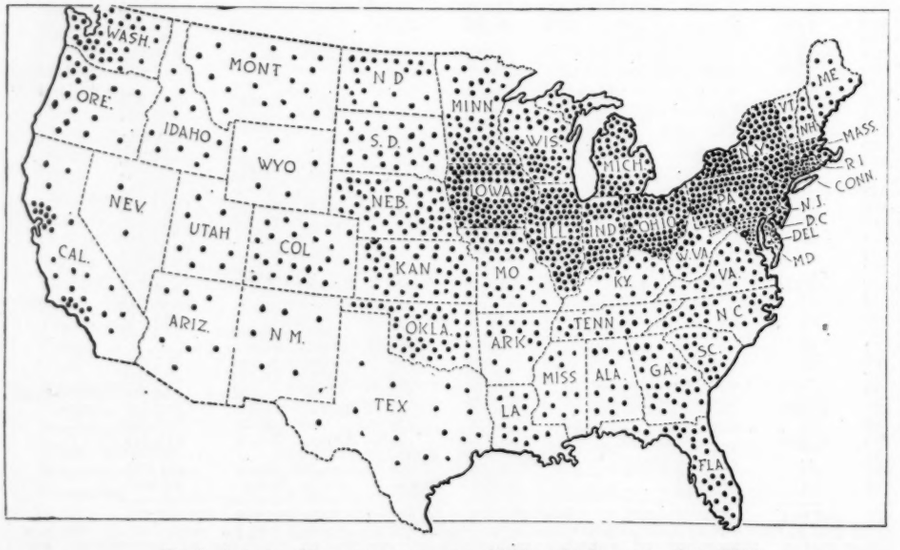
The total number of new registrations in New England showed a heavy falling off in 1917 as compared with 1916. In 1916 the increase in registrations was 86,421, whereas in 1917 the increase in registrations dropped to 58,239, a decrease of 28,182.

The record of holding the greatest number of car and truck registrations in relation to population is enjoyed by the agricultural states, with Iowa in the position of leadership with a ratio of one car for every eight persons in the state. Iowa has occupied this position of leadership for several years. In the calender year of 1915 it had one car for every sixteen persons. In 1916 this ratio of cars was increased to one car for every thirteen. In the 1917 year a new record was placed at one for every eight.

Iowa has not much margin of leadership in this registration ratio, and again one of the great agricultural states is a close contender, Nebraska having one car for every nine of population. Nebraska has made rapid gains in the last three years. In 1915 the ratio was one car to every twenty-

## Increase in Registration

| State | Increase In Cars | Per Cent Increase |
|---|---|---|
| New York | 124,841 | 45 |
| Iowa | 105,422 | 61 |
| Pennsylvania | 94,505 | 41 |
| Illinois | 88,992 | 35 |
| Ohio | 81,451 | 32 |
| Michigan | 55,362 | 34 |
| Minnesota | 54,000 | 39 |
| Indiana | 50,295 | 36 |
| Oklahoma | 47,481 | 90 |
| Wisconsin | 46,928 | 40 |
| Nebraska | 46,900 | 46 |
| Kansas | 40,078 | 35 |
| Missouri | 38,277 | 35 |
| Washington | 31,276 | 50 |
| California | 30,198 | 14 |
| Florida | 24,996 | 176 |
| Georgia | 24,721 | 54 |
| South Dakota | 22,887 | 52 |
| Maryland | 22,765 | 68 |
| Colorado | 22,670 | 51 |
| North Dakota | 21,232 | 51 |
| North Carolina | 20,800 | 59 |
| Virginia | 20,235 | 57 |
| Connecticut | 18,594 | 33 |
| Massachusetts | 18,254 | 13 |
| South Carolina | 17,822 | 89 |
| Montana | 17,311 | 70 |
| Oregon | 17,215 | 56 |
| Tennessee | 17,100 | 54 |
| Kentucky | 15,900 | 50 |
| Texas | 15,647 | 7 |
| Arkansas | 14,158 | 96 |
| New Jersey | 12,313 | 16 |
| Idaho | 11,320 | 87 |
| Mississippi | 11,176 | 54 |
| West Virginia | 10,869 | 53 |
| Louisiana | 11,636 | 58 |
| Alabama | 10,519 | 47 |
| Maine | 9,548 | 67 |
| District of Columbia | 8,080 | 61 |
| Arizona | 7,768 | 63 |
| Utah | 7,719 | 57 |
| New Mexico | 6,058 | 75 |
| Wyoming | 4,876 | 68 |
| Vermont | 4,299 | 30 |
| New Hampshire | 3,808 | 26 |
| Rhode Island | 3,736 | 17 |
| Nevada | 2,151 | 47 |
| Delaware | 2,135 | 28 |
| | 1,396,324 | 54 |




*Each dot on this map represents* **1000** *vehicles gained in* **1917**

one persons. In 1916 it was cut to thirteen persons, and for 1917 it was placed at nine.

Iowa and Nebraska have a good lead on the other states, and following them are other agricultural states, with South Dakota one machine for every eleven, which figure is shared with Montana. Then comes Kansas, North Dakota, Minnesota and California all on even terms, with a car for every twelve of population.

Indiana, Ohio, Wisconsin and Oregon, all grain states, have a ratio of one car to every sixteen persons. In the western mining states, where population is sparse and distances great, there is a high ratio of cars to population. Nevada has a one-to-sixteen ratio. Wyoming has one to fifteen. Montana has one to eleven. Idaho has one to eighteen. Arizona has one to thirteen, and Colorado has one to fifteen.

**Ratio to Population**

The ratio of cars to population in the South is relatively low notwithstanding the big percentage increases made in all of the Southern states in 1917, as compared with 1916. Florida, although showing a percentage increase of 174, has a ratio of twenty-three to one. North Carolina has sixty-four to one. Georgia has forty-one to one. It will be some time before the ratio in the South approaches the figures of the agricultural states in the Mississippi Valley.

The car population ratio in New England generally ranges at twenty-four to one, with the single exception of Connecticut, which has the record for the group, with a ratio of one car for every seventeen population.

### KAPP RESIGNS FROM MITCHELL

Racine, Wis., March 22—Frank A. Kapp has resigned as advertising manager of Mitchell Motors Co., Inc., to become associated in the publication of *Motor Life*, the *Blue Book* and the *Automobile Trade Directory*.

### WINTHER QUADRUPLE-DRIVE

Kenosha, Wis., March 22—The Winther Motor Truck Co., Kenosha, Wis., has completed the first model of a new type of quadruple-drive motor truck designed especially for Army service and the car is now in the hands of Government engineers for exhaustive tests.

### TO CONTINUE RUSH TRUCKS

Philadelphia, Pa., March 25—The Rush Motor Corp. has been organized to continue the production of Rush trucks, render service to Rush owners and resume the sale of Rush parts, both wholesale and retail. The stock of the old Rush Motor Truck Co. was purchased at the receiver's sale and will be supplemented by a supply of additional parts. The company is now in operation.

### HUPP DRIVING CARS OVERLAND

Detroit, March 23—Forty-two Hupmobiles left the plant of the Hupp Motor Car Corp. yesterday over the road for the Howard & Murphy Motor Co., Kansas City, Mo., distributer. Twenty Hupmobiles also left for the Warren-Goodwin-Fields Co., Louisville, Ky., and to-day thirty will leave for Omaha.

# Farm Classes for Boys

## 1,500 in Chicago Are Learning About Gasoline Engines and Tractors

### To Help Increase Food Supply of United States

CHICAGO, March 22—Through the cooperation of the Chicago high schools and the International Harvester Co. something like 1500 boys are being fitted for efficient help on the farms this coming summer. The boys are given elementary instruction in the principles and operation of gasoline engines and the adaptation of the farm motor to tractors, in the construction and operation of farm operative equipment, how to harness, drive and care for horses and how to perform other duties calculated to turn them into fairly efficient farm hands.

The course has been running for several weeks now and will continue until about May 1. It consists of theoretical instruction in the classroom, work with the equipment, which some of the schools possess, and in addition afternoons spent among machinery. The classes, in squads of from twenty to forty, each afternoon go to the display rooms of the International Harvester Co., which the company has donated for the purpose, and here they are given practical instruction in the construction, operation and care of farm machinery.

Unfortunately, owing to limitations of time and opportunity, such instruction as can be imparted on farm motors is necessarily very elementary. Still, the boys will carry away with them a very good general notion of what a gasoline engine and a tractor look like and will have a more or less compressive knowledge of what they are designed to do. The instruction on general farm operative equipment is more thorough and practical.

**Barlow in Charge**

A. S. Barlow, in charge of the retail farm operative equipment department of the harvester company, devotes his afternoons to the work and takes charge of the classes during the time they spend in the display rooms. He lectures on the construction and the use of the various farm implements and demonstrates their operation as far as it is possible to do so on a sample floor. Following his lecture the boys are allowed an additional half hour, during which they are permitted to clamber over the various machines, manipulate the levers and generally familiarize themselves with the appearance and functions of the equipment. This encourages them to make individual investigation and the interest they manifest is indicative of their desire to learn all they can.

The use of the sample room and Mr. Marlow's time are contributed by the International Harvester Co., and the time the boys put in under Mr. Marlow's instruction counts as regular class work. The result will be that when the boys get out onto the farms this summer they will be of real assistance to the farmers. With the knowledge they will have acquired of the mechanical construction of the implements which have been explained to them they very soon will pick up the actual operative skill and will become efficient farm helpers within a short time. The interest the boys display in their work is a gratifying indication that they realize the seriousness and importance of the work they have undertaken and is also evidence that they intend to make themselves as proficient as the opportunity which has come to them will permit.

### TALKS ON SIGNAL CORPS WORK

Chicago, March 23—A talk on the work of the Signal Corps by Col. L. D. Wildman, chief signal officer, Central Department, U. S. A., and an illustrated lecture on motion pictures as a selling medium for automotive products by William Lehle, president Commercial Motion Picture Mfg. Co., Chicago, comprised the program last night of the Mid-West section of the S. A. E.

Colonel Wildman spoke on the work of the major departments of the Signal Corps and the tremendous task that had confronted them in expanding to meet the demands of a large army. Motion pictures demonstrating the use of the tractor on the farm and the manufacture of motor cars were shown.

### TO MAKE MORE FARM BOYS

Columbus, Ohio, March 22—Plans practically have been completed for the organization of a farm tractor corporation with $1,000,000 or more capital stock. The basis of it will be the McIntyre Mfg. Co., a $100,000 concern. This company makes a tractor known as the Farm Boy. Practically its entire present output and that for some time in the future, unless increased, is under French contract. Plans are to double the output.

### WOMEN HELP MAKE DRIVEAWAYS

Jackson, Mich., March 22—A dealer from Parsons, Kan., brought to the Briscoe Motor Corp., five women and one man to drive away a train of cars. The route will be via Indianapolis, Springfield, Hannibal and west to Parsons. The Briscoe company has driven away 300 cars during the last two weeks, most of them going westward.

As soon as it is decided which of the two new sedan bodies will be adopted the Briscoe company will start production immediately. It is expected this will begin in two weeks and the price will be announced at the same time.

### PURDUE TRACTOR TRAINING

Lafayette, Ind., March 23—Eighteen men took the short course for farm tractor operators offered by Purdue University and which has just been completed. Most of the men were out of the draft age. The oldest student was fifty-six and the youngest, eighteen. Eight different makes of tractors were available, and the men worked nine afternoons just on running the tractors. By changing squads every man had an opportunity to run every tractor. Expert mechanics from the various companies drilled the men in the necessary features pertaining to particular tractors.

# Spring Overhauling

In Two Parts—Part II

*By B. M. Ikert*
*Motor Age Editorial Staff*

## Steps 1-7

1. Notebook in hand, go over car and jot down parts needing:
   (a) Replacement.
   (b) Repair.
   (c) Adjustment.
   (d) Close inspection.
   (e) New Fitments.
2. Kerosene on rusted nuts.
3. Put car on horses.
4. Remove: (a) Fenders.
   (b) Wheels.
   (c) Sod pan.
5. Thorough cleaning of car.
6. Thorough cleaning of garage.
7. Lay out your tools.

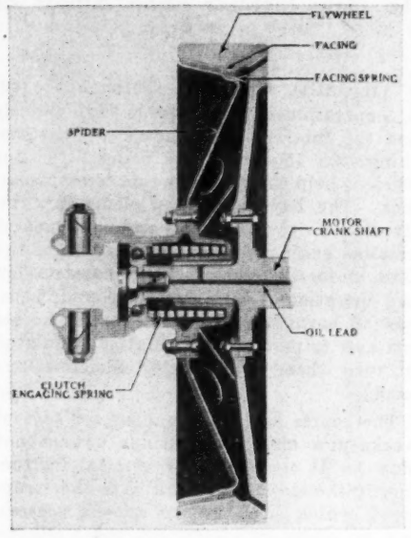
## Steps 8-21

8. Engine in general.
9. Gasoline system.
10. Lubricating system.
11. Cooling system.
12. Ignition system.
13. Clutch.
14. Gearset.
15. Rear axle and universals.
16. Brakes.
17. Steering gear and front axle.
18. Springs.
19. Electric system.
20. Tires.
21. Top and upholstery.

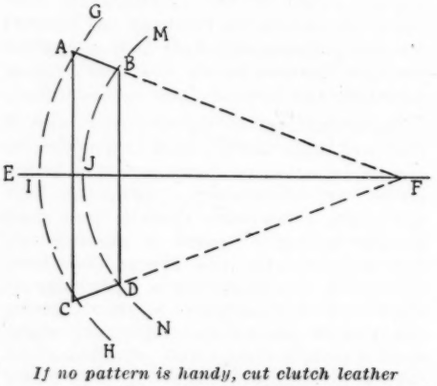
WHEN you have the engine all cleaned up and adjusted for wear, lubricating and cooling systems gone over, you can proceed with the rest of the chassis, including clutch, gearset, rear and front axle, universals, springs, etc. If the clutch and gearset are in unit with the engine and the latter has been removed for taking up the main bearings, ets., the clutch and gearset should be looked over while the engine is still out of the frame. Most owners, however, are not in a position to carry out repairs and adjustments in the gearset and clutch of a difficult nature, and should these be necessary a competent repairman should be trusted with the job. Work of this kind necessitates special gear pullers, etc., which essentially belong to garage equipment and are not common in the motorist's tool kit. On the other hand, there are those who being remote from larger cities are called upon to do most of their own overhauling throughout.

Clutches as used in the modern cars are of three kinds, cone, dry-plate and multiple-disk, running in oil or not, as the case may be. The Ford planetary transmission is an example of a multiple-disk clutch running in oil. Cone clutches can be subdivided into two types, one using a leather face running dry and the other, a fabric face running in oil. If the leather of the former has worn to such an extent that it functions improperly, it must be renewed. This is only to be done when treatment with neatsfoot oil does not soften up the leather. Clutch leather when it dries out becomes hard and causes the clutch to grab. Eventually the leather must be replaced.

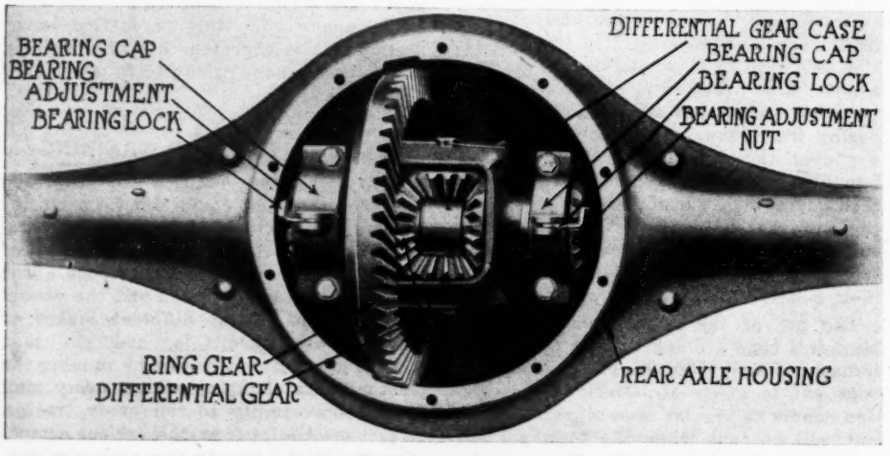
To install a new clutch leather soak it in water or neatsfoot oil and stretch it over the clutch drum or cone. Usually a new leather can be secured from a service station or factory already cut to shap. Nearly every cone clutch of this kind is provided with spring-actuated plungers, which raise the leather slightly and allow gradual engagement of the cone. When the new leather is installed these plungers must be drawn below the surface of the cone and held there until the new leather is riveted



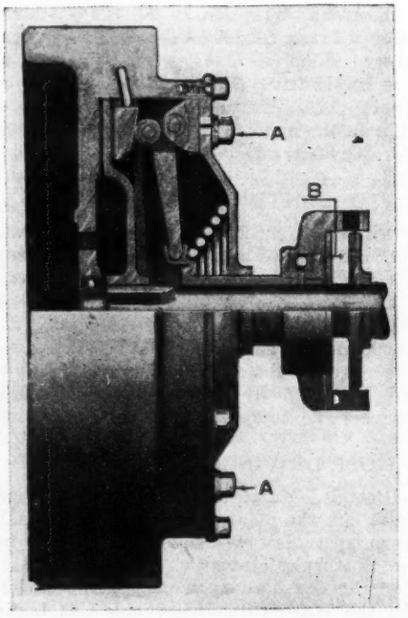

*Cone clutch, leather of which must be oil-treated occasionally*



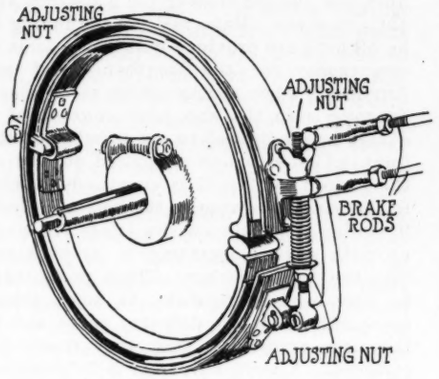

*If no pattern is handy, cut clutch leather from cone dimensions*



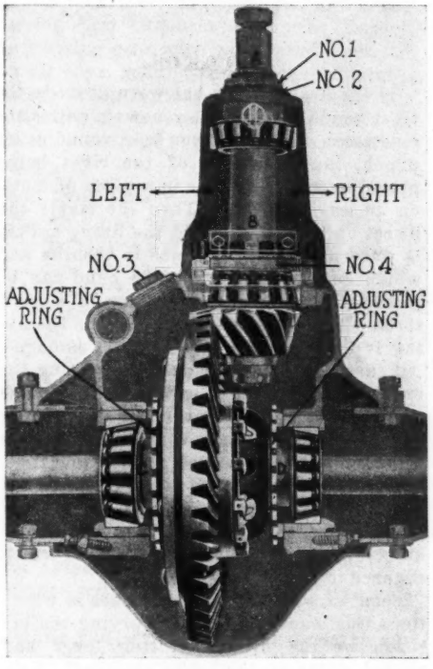

*Rear axle with cover plate removed, showing adjustments which bring the ring gear and pinion closer or farther apart*



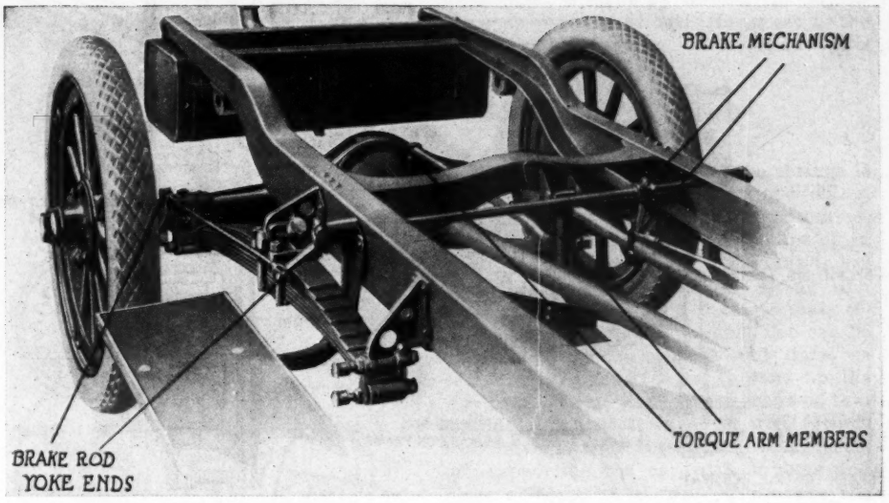

*Sectional view of three-plate dry-disk clutch, showing adjustment*




*Typical brake mechanism, showing where the adjustments are made*




*Plan view of spiral-bevel driven rear axle, showing adjustments*




*Semi-plan view of rear end, showing parts frequently neglected. These parts are sometimes difficult to get at and receive little oiling*

in place. Be sure to have the heads of the rivets well below the surface of the leather, otherwise the clutch will grab. If the leather only needs softening up, castor oil can be used in the absence of neatsfoot. A greasy clutch leather allows the latter to slip, which can be remedied by an application of Fuller's Earth, thrown on the facing. The facing absorbs some of the grease. Kerosene will also remove some of the grease or oil.

A method for determining the size and shape of a clutch leather, which can be resorted to when no clutch leather is available and it is necessary to make a new one, is shown in the illustration. It is first necessary to dissemble and remove clutch. Next measure the front and rear diameters and the width of the clutch cone and make an accurate full-sized drawing of it on paper. Then through the center of the cone draw the center line EF and extend the lines AB and CD until they intersect the center line EF. Using AF and BF as radii, describe the semi-circles AIC and BJD. The space inclosed by these semi-circles represents the shape of half of the clutch leather. This pattern can be reversed and used to lay out the entire leather, which should be cut in one piece about 1 in. longer than is necessary to take care of any irregularities in fitting.

When adjusting the spring inserts of a cone clutch see that they are taken up evenly. Give them all the same number of turns. If the clutch-engaging spring is weak, change the adjustment. If there is no adjusting nut, the pressure on the spring can be changed by placing a washer between the spring and its seating. Some cone clutches, like that of the Overland, have three springs to hold it into engagement and the tension on these is varied by screwing the adjusting nut in or out, giving all the same number of turns. The springs should be so adjusted that the clutch engages with sufficient force so it will not slip and yet may be relieved without undue pressure applied to the foot pedal. Examine the clutch rollers, which by pressure upon the clutch shifter yoke disengage the surfaces. The rollers may be worn or in need of lubrication. They should be kept well supplied with grease. There is a thrust bearing back of the clutch which should be well cleaned and supplied with fresh oil or grease. Usually a hole or grease cup is provided for this.

The non-adjustable dry type of multiple-disk clutch requires but little attention. As the fabric-lined plates begin to wear, compensation is secured by changing the adjustment on the clutch pedal. The latter must be free so it does not strike the floor boards, thus holding the clutch practically released. The wet type of disk clutch consists generally of metal-to-metal plates running in an oil bath. Before making any adjustment for slipping the case should be washed out thoroughly with kerosene and then a supply of clean oil put in. If slipping still persists, the tension on the springs should be changed by tightening the studs all around.

The dry-plate clutch has a simple adjustment. A cross-sectional view of this is shown in the illustration. There usually are three plates. Adjustment is made by two set screws which swing in a circular slot. To adjust for tension the screws are loosened and moved in a clockwise direction, along the slot with the clutch disengaged. The screws are shown at A. They should be so placed that the distance B equals ½ in. This gives the clutch plenty of release and prevents dragging.

The cone clutch running in oil has practically the same adjustments as the leather cone type. If the former grabs, the old oil should be drained off and the bath replaced with a fresh supply. The clutch release bearing carries the load when the clutch is thrown out and in most designs is oiled by a grease cup attached to a flexible tube. In some clutches it is necessary to remove the inspection plate to lubricate this bearing.

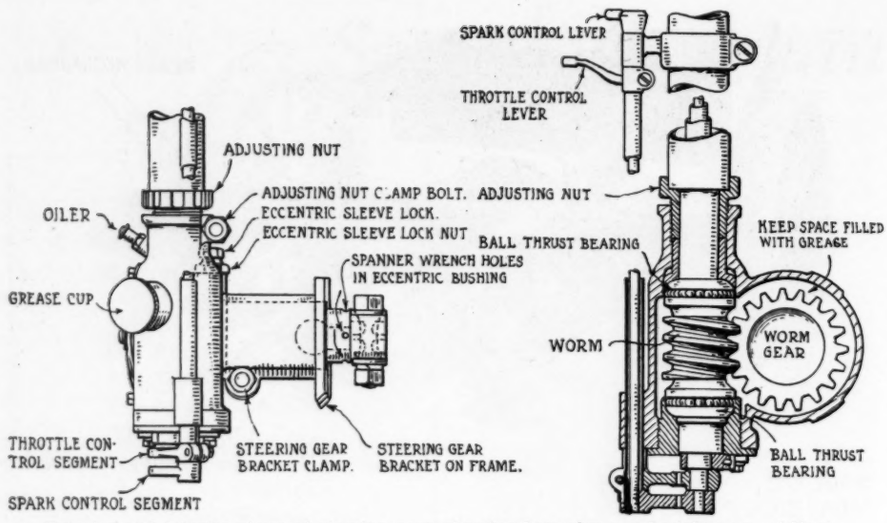
## Gearset

The gearbox cover should be removed and the case filled with kerosene and the resulting solution drawn off through the opening in the bottom of the case. When the whole is thoroughly cleaned out, repack it with grease or oil, replace the gasket carefully and bolt down the cover. If considerable repair work is necessary in the gearset, it had better be trusted to a repair man.

When replacing ball bearings in the gearset case or on the shafts, care must be taken to see that the balls or races are not damaged from improper handling. Where the bearing is to be put on a shaft the force should be applied to the inner race, using a piece of pipe and hammer. If the bearing is to be forced into the gearset case, the driving effort should be applied to the outer or larger race in such a manner that no strain is imposed on the steel balls themselves.

## Rear Axle—Universals

The rear axle and universals must come in for their share of attention about this time. Unless there is something radically wrong with the former, it need not be taken apart. However, if the gears are worn or damaged they should be replaced. In the majority of cases the only work necessary on the rear axle consists of replacing the lubricant and adjusting the gears. In some instances, like Overland, where the




*Exterior and interior views of steering gear, showing how play can be taken up. Adjust with wheels locked to one side as far as possible*

gearset is in unit with the axle, both can be overhauled at the same time.

Excessive back lash, looseness between the bearings on the pinion and shaft or at the differential and objectional noise make it imperative to overhaul the rear system. The two illustrations show how adjustments are to be made and while axles vary, the following mode of procedure, with certain modifications, will apply to all.

To take up back lash, the ring D should be backed toward the differential and ring C turned against the bearing cap. This forces the gear toward the pinion. Before turning the rings loosen the cap screws in the bearing caps a half turn after the lock wire has been removed. There should be just a little play in the gears, 0.005 in. or so, a barely perceptible looseness. When the adjustment has been made be sure that the locking pins are back in the slots of the rings, tighten the cap screws and replace the locking wires.

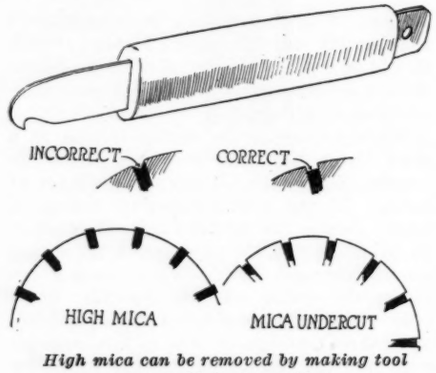
**Looseness in Bearings**

To take up looseness in the bearings of the pinion shaft, loosen nut 1, tighten up on nut 2 enough to let the shaft run free without end play, back off a quarter turn and tighten up on 1. For taking up looseness in the differential bearings adjust rings C and D away from the differential after loosening cap screws and lock wire.

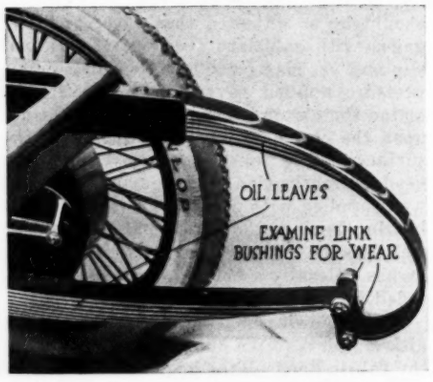
To eliminate noise loosen nut 1 at A and then loosen nut 2. Remove cover at B and loosen clamp bolt 4. Turn the slotted adjustment cap toward the left one notch and tighten up on 2, then 1, just enough to let the shaft run free without end play. If this lessens the noise, loosen nuts and turn the cap another notch and repeat the operation until the quietest place is found. If the noise increases, adjust in the opposite direction.

In any case after you have taken off the cover plate you will see how the adjustments are to be made. On some cars the small drive pinion only is adjusted, and the adjustment is placed on the outside of the driveshaft housing.

To get at the Ford rear axle, the latter must be removed from the car and taken apart by taking out the bolts that connect the two halves of the housing, as well as those holding the driveshaft tube in place.




*High mica can be removed by making tool out of old hacksaw blade*




*Attention to spring leaves and links prolongs life of chassis and engine*

There are no means for taking up the play in the drive pinion and ring gear other than replacing the large thrust washers behind the ring gear. The same is true of the Chevrolet 490. If owners of such cars have occasion to take down the axles it would be well to install a Bailey ball-thrust bearing made only for these two axles. The thrust then will be taken by steel balls, and the result is a much easier running axle. They are interchangeable with the old washers and require no machine work to install.

Examine the universal joint for wear. If it is of the leather-disk type the latter may have become oil-soaked and must be replaced. A new disk can be had from the service station or factory. If not available, use the old leather for a pattern and cut a new one. Universal joints running in an oil bath are provided with a slip joint to compensate for the lengthening of the driveshaft when spring action takes place. In some case the slip joint consists of a square hole broached in one member of the joint, which slides on a squared portion of the gearset shaft. This eventually results in jurky action owing to the hole and shaft becoming worn. Other slip joints are made up with splines operating in grooves cut into the joint member. These parts must be kept well lubricated. In some joints are bushings for the different parts, and if these are excessively worn they should be replaced. A worn universal is detrimental to the whole drive system. In a comparatively new car the only attention the joint needs is a good cleaning out and repacking with light cup grease or heavy oil.

## Brakes

If the brake lining has worn down to the rivet heads it should be renewed, unless the rivets can be sunk lower by a round-nosed punch, the other end of the rivet being placed over a small hole in a piece of metal on an anvil or vise. Then the rivets can be set up tighter. Should the lining appear in good order the oil which it absorbs and which gets back of it on the band can be removed by applying the flame of a blow torch. This dries up the oil, and as the lining is fireproof the latter is not damaged. All cars have some means for adjusting the brakes. To test for adjustment jack up the rear wheels and with the engine running and driving them, have some one apply the brakes to see if both stop at the same time, which is necessary. On some cars without equalizers the adjustment is made by lengthening or shortening the brake rods by screwing off or on the yoke ends which connect to the brake cams.

Some cars are fitted with brakes in which the adjustment is made by varying the position of the brake-operating lever and slotted clevis on the brake camshaft. Usually there is a hand adjustment on the contracting brake, as shown in the illustration. Sometimes all the overhauling the brakes need is a cleaning out of the drums with kerosene, applying a little also on the brake linings. If grease or oil works its way to the brakes, either too much is carried in the differential or the felt washers in the axle need replacing. Brake lining is expensive and many times the old material will do, if properly handled, with kerosene and a little oil to raise the fiber.

When you go over the brake system be sure to inspect the clevis pins, etc., for wear. These parts frequently are overlooked and the result is an unpleasant rattle on the road. The best way to fix them is to make a leather boot out of thin material and lace it over the joint, after filling with grease. Oil first should be applied to the joint.

## Steering—Front Axle

The chances are there will be some play in the steering gear and front axle joints. The play in the gear can be taken up by the various adjustments provided. The up and down play of the wheel is taken up by loosening the clamp screw on top of the

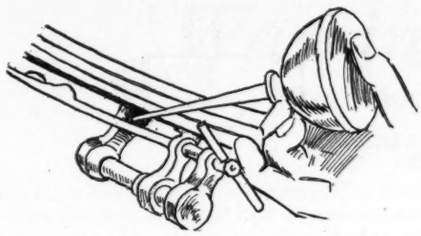
frame bracket and turning the adjusting nut down. This action forces the shoulder on the column closer to the thrust bearing, as shown in the illustration. Most gears have an eccentric bushing on the side to take up the play between the worm and wheel, or sector, as the case may be. There are holes or slots in the eccentric bushing for turning it after the clamping device has been loosened up. If this does not take up the play there is still another remedy. Remove the steering gear by disconnecting all the spark and throttle controls, dash brackets, etc. Then take off the steering arm and turn the wheel so the square shaft will make a quarter turn In other words the corner A will be replaced by B. Then the arm is clamped back. This operation brings a new surface of the worm and wheel into engagement and takes up the play. The eccentric bushing should be turned back, so it can be used to take up the play in the usual manner, after the steering arm has been changed. Repack the steering gear with grease and clean out the oil cups, refilling with clean lubricant. Always when making adjustments on the steering gear have the wheels locked over either to the right or left, as far as they will go.

**Clean Drag Link**

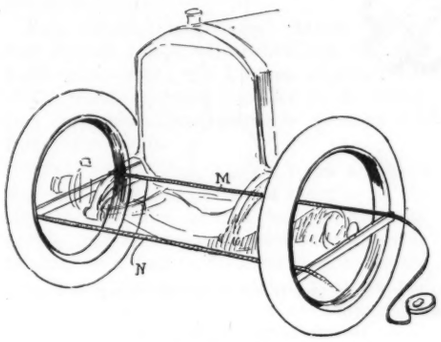
The drag link which connects the ball arm with the steering arm of the spindle should be taken off and the inside cleaned out. Adjustment for this is made by screwing the slotted nut either in or out and then replacing the cotter pin. Repack the joints with fresh grease and if possible put on a leather boot.

If there is considerable play in the steering spindles, the bushings should be renewed and in some cases the pin itself must be replaced. Always cover the surface well with oil when replacing, as when new parts are fitted there is little space between the walls and it takes the oil some time to get there. You may drive quite a distance with the joints dry and soon ruin them.

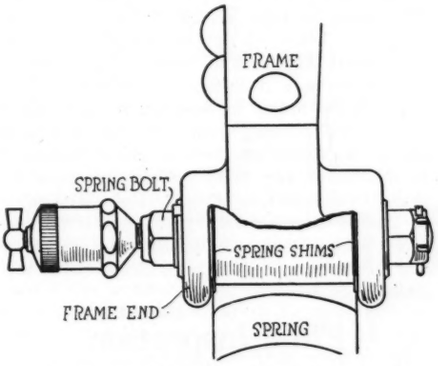
While you are on the front axle you can put back the wheels after the hubs have been cleaned out and the bearings examined for wear. Wheels are fitted with ball or roller bearings, and in either case the adjustment is made by turning the adjusting cone or nut in or out. Never set up the nut so tight that the wheel binds. This ruins the bearing.



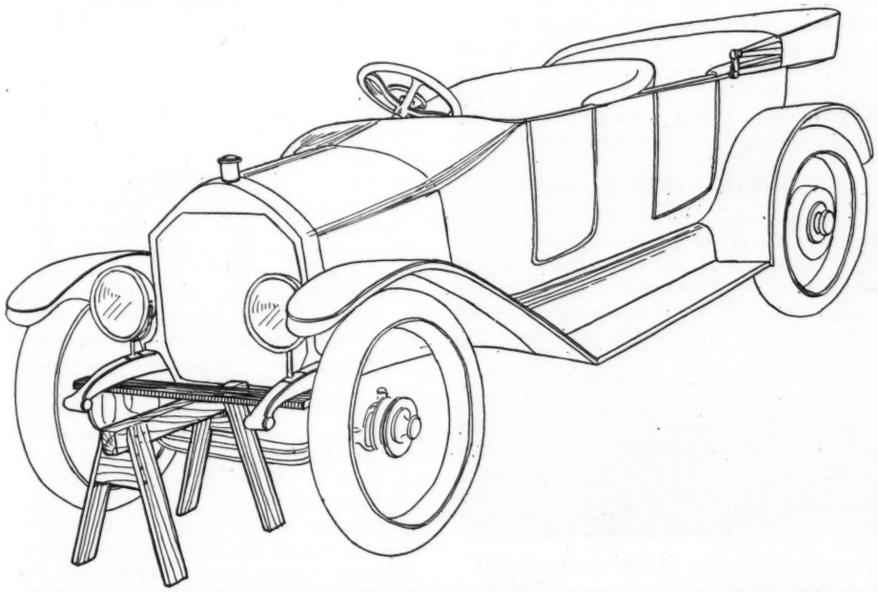
*Oiling spring leaves, using spreader to hold leaves apart*




*In lining up wheels, make N about ¼ in. less than M*




*Taking up side play in spring links with shims*



***Put a saw horse and two by four under the front end when it is necessary to take off front springs from the car***

## Springs

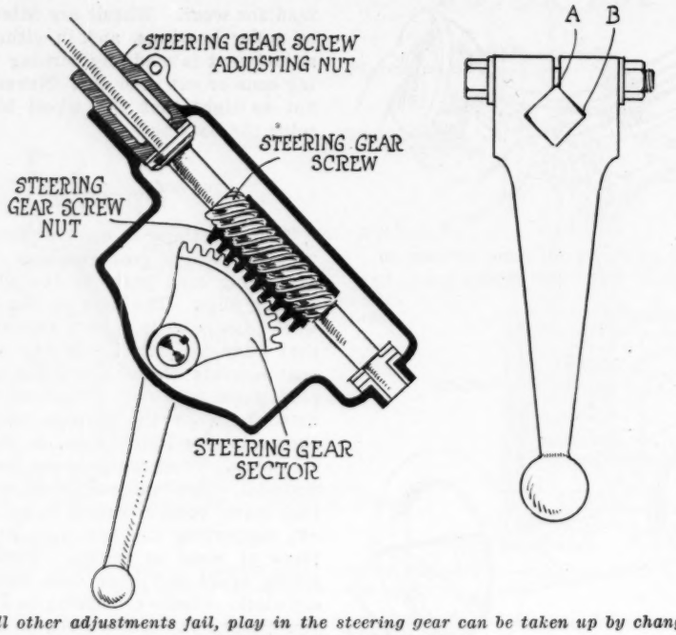
The only thing to do with the springs is to give them a good cleaning and oiling, examining such parts as the clips and retaining clips. The nuts on the clips often work loose, and it is very important to see that they are tight. If the spring link bushings are worn to a great extent, replace them with new. Washers also can be fitted between the springs and links, as shown in the illustration, to take up the side play. These washers are made of thin material. The best way to do with springs that have become rusted is to take them off, supporting the car with a horse and piece of wood as shown. Then take the spring apart and clean each leaf with emery cloth. Clamp the spring in a vise when you remove the center bolt, or use clamps, otherwise it is a very difficult job to get the bolt out.

## Electric System

Go over the electric system and examine for loose connections and frayed wires. Most of the makers use armored cables for this and there is not the trouble nowadays with these parts as formerly. Take the storage battery out of its retainer and clean the outside, as well as the inside of the box. Acid slops over when the battery is filled too full, and eventually this eats the metal or wood. See that the battery is filled with distilled water and put it back.

The starting motor should be given an exterior cleaning and if necessary new brushes fitted. See that there is proper lubrication of the teeth on both the flywheel and starter pinion. Also see that the holding-down bolts are firm. The generator may need new brushes, and if it has not been charging properly examine for high mica. This condition of the commutator is shown in one of the illustrations and must be remedied. The mica can be undercut by taking out the armature and clamping in a vise. Then make a tool as shown out of an old hacksaw blade, so that its cutting end is just the width of the slots in the commutator. The mica can be cut down to the surface of the commutator segments first by revolving in a lathe and applying sandpaper, or, by hand, in the same way. Then undercut it with the tool so it appears as shown. Other parts like the ammeter, cut-out, etc., need only an inspection, and occasionally the points of the cut-out need replacement. If you are not sure about the lighting or starting system you had better consult a service station.

Occasionally the generator drive chain needs tightening, and one manner in which this is carried out is shown in the illustration. Here the generator is moved bodily away from the engine on its bracket by the adjusting nut placed on the side. Then when the chain has the proper tension the nuts in the bottom are tightened, which clamps the instrument in place. Other




*When all other adjustments fail, play in the steering gear can be taken up by changing the ball arm on squared shaft*

types have a sprocket operating in an eccentric bushing by which the chain tension can be varied. Take the chain off and clean it in kerosene, then immerse it in an oil bath. Put it back so it runs in the same direction you took it off. Clean out the inside of the lamps, replacing any bulbs that are defective or burn dimly.

## Tires

If you have kept your car in storage all winter, you will have repaired the tires long ago, provided you are a careful motorist. But if you have not, you must do so now.

Repair any large cuts in the tubes and casings with a vulcanizer and if the cuts are too big, let a shop do the job. Such concerns have larger equipment and it is far better in the long run. Wash the tires with soap and water and put talc or mica in them for lubricating the tubes. Clean the rims with emery cloth and give them a coat of rim paint. Always when putting back the tires see that they run in the same direction as they did before, that is, the rubber builds up in a certain direction and the tire adjusts itself accordingly, so when it is run in the reverse direction, rapid wear takes place. When you take off the tires put an arrow on them with a piece of chalk, so when you replace them they will run correctly. The same is true of the spare.

## Top and Upholstery

If there are any tears in the top fabric have them sewed up. Should it be discolored and brittle, go over it with a good dressing and let the latter soak in. There are many top dressings on the market, and these come with full directions for use. The same is true of upholstery and side curtains. Touch up any of the places where the fabric has become shabby, and where it is loose tack it back. Sometimes an old car can be made to look quite up-to-date simply by putting new binding material along the doors and where the upholstery is tacked to the body. New linoleum on the floor also helps. Every owner will have to decide for himself just how much he must do on the car's fittings and if there are any accessories to be added now is the time to do so.

## Final Inspection

Finally, the car should be gone over to see that no part has been neglected. Auxiliary devices like shock absorbers, speedometers, horns, etc., should be gone over and any adjustments made. When all this is done and the car has been taken on the road for a tryout, the mechanical work can be called finished. The body then should be gone over with a good polish, and the owner is ready once more for the season.

### TO DISCUSS WAR PROBLEMS

Chicago, March 25—Beginning Wednesday of this week Chicago will be the meeting place of a national conference on labor problems under war conditions under the joint auspices of the Society of Industrial Engineers and the Western Efficiency Society. The meetings will be held at the Hotel LaSalle, and all interested persons are invited to attend. Subjects for consideration on the program include women in industry, securing the maximum of production from men remaining; mechanical equipment and its function in replacing men; and readjustments after the war to care for those returning.

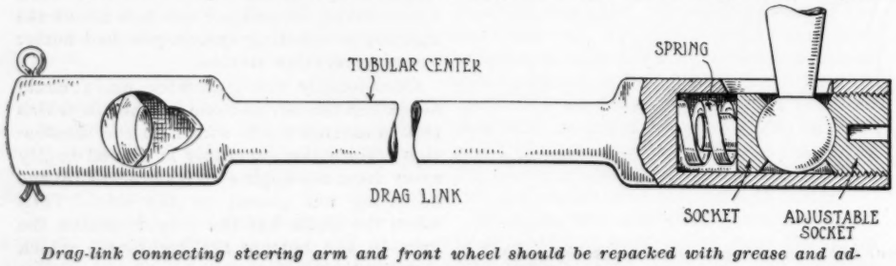
The work of women in the war will be emphasized, especially in the first report of conclusions of 1000 questionnaires on women in industry, which is to be made Wednesday evening. A round table conference on this will be held Thursday morning. The meeting will close with a banquet Friday night, at which Samuel Insull, chairman of the State Council of Defense, and men of the Surgeon-General's Department and the British-Canadian recruiting mission will speak, with others.

### FISHER HEADS A. A. A. TOURING

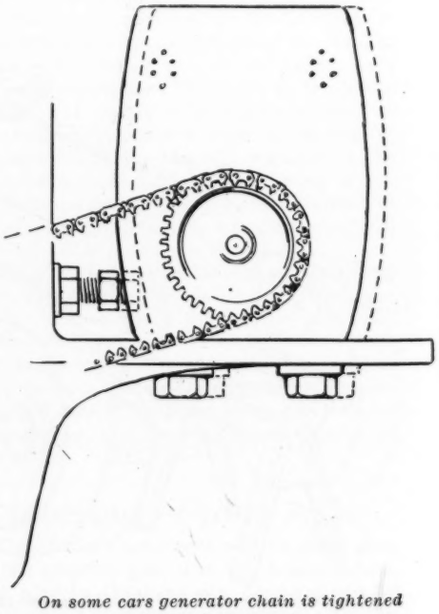
Washington, March 23—Carl G. Fisher has been made head of the touring board of the American Automobile Association, and Clifford Ireland has been made legislative chairman.

### TRACTORS CELEBRATE ST. PAT

Columbia, Mo., March 22—A motor car and tractor show featured the fifteenth annual St. Patrick's celebration by the students in the School of Engineering here Saturday. The celebration is based on the theory that St. Pat was an engineer, and each year the school holds a knighting ceremony in which St. Pat's representative knights certain of the students and faculty. This year tractors and passenger cars were main features of a celebration affected throughout by the war, which has called so many engineers and is calling others. Plans were made for an Army aviator to fly from Belleville, Ill., to Columbia, and the knighting was performed from an airplane on the university campus, after which a service flag with 150 stars for enlisted students from the school was unfurled. The Westinghouse Electric Co. and the General Electric Co. were among the firms with exhibits.




*Drag-link connecting steering arm and front wheel should be repacked with grease and adjusted by screwing in socket in end*



*On some cars generator chain is tightened by sliding instrument over*

# War in the Air

By Robert A. Drake

In Two Parts—Part II

**Photograph taken 6 miles back from the trenches on a practice field, showing French machine gun which is one of the types in general use**

ONE morning just at daybreak I was speeding down the road to Caissy, within easy reach of the front lines on the Chemin des Dames, when a French fighting plane came skimming along the ground only 200 or 300 ft. from the hilltop. The machine was flying at right angles with the road, and the black clouds of German shrapnel smoke were following the plane as closely as ever a cat followed a mouse, and I soon realized that, whether I went fast or slow, I could not help passing directly beneath the plane. There was no danger from the avion itself, but the shrapnel exploding around the plane pattered on the roof of the car, and it was only by ducking my head and speeding up that I escaped this unusual danger.

One huge French observation plane made itself conspicuous day after day because it flew so low to the ground and never went nearer the front lines than 4 miles. It earned the nickname of Camion Bazaar, the name of the clumsy traveling store of the soldiers. Indeed the truck that brought up the luxuries for the *poilus* came as near the front and accomplished much more in its way than this particular plane could possibly accomplish.

**Germans Fly Low**

At Ostel the Boche avions took delight in passing overhead so low that the German's head in the driver's seat was distinctly visible. Sometimes I thought the aviator had been turned back toward his lines by the French anti-aircraft guns, but the Boche only swerved back again so close to the ground that the machine guns from a dozen different points began to shoot. The exhaust from the engine of the plane streamed out beyond like a soft gray tube that melted gradually away into thin air a hundred yards behind the roaring engine.

The Germans almost invariably began their scouting expeditions when the sky was dotted with clouds. It was immaterial whether the clouds were 500 ft. or 5000 ft. from the ground; they merely waited until the path of vapor led from their lines to those of the French. Then I heard the buzz-er, buzz-er noise that warned of the avions' approach, and the helpless French anti-aircraft guns either did not shoot at all until the gleam of the plane flashed between the clouds, or fired at random into the cloud that seemed nearest the noise. The white glittering bodies of the planes, traveling almost as fast as bullets, dodged in and out of the mist as if they were playing a glorified game of hide and seek.

Both German and French avions twisted and turned continually when the shrapnel puffs came near, and I often expected two of the planes to crash together as the fifteen tiny dots criss-crossed paths in as many different directions.

In the second-line trenches I saw a French boy only seventeen years old shooting at the German airplanes with a *fusil mitrailleuse*, a rifle that had an attachment for shooting machine gun bullets fastened just under the breech. Although this curious weapon had merely a light iron tripod to support its muzzle, the recoil was so great that it shook dirt and stones down the airshaft of the quarry used as a *poste*, much to the disgust of the doctor in command. But far in the heavens the German planes still sailed on their way undisturbed by the rain of bullets from below. They looked like tiny flies crawling across a mottled blue and white mosaic ceiling.

Either for the sake of comradeship, or more probably for mutual protection in case a squadron of enemy airplanes suddenly dropped out of the clouds above them, both French and German planes almost invariably flew close together. From what I could learn, each aviator was free to fight an approaching opponent or not, as he saw fit. No one except the aviator flying beside the machine could recognize his comrade to command or complain of his actions while in the air, but it was an unwritten law that once a fight was begun, one aviator should never desert his companion in the air. Exceptions proved the rule. A French aviator who had two decorations and a decided limp once confided his story to me.

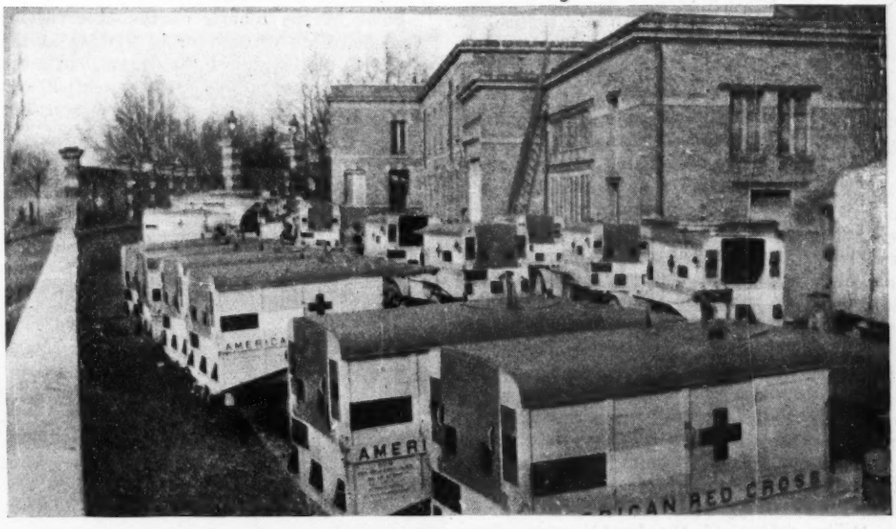
"I'd never have been wounded if my fellow aviator hadn't turned around and run home. Two Germans came out of the clouds at me, but both of us together could have handled them all right. But when I looked around to see where he was, he was not in sight! Then of course the Fritzies got me!"

I first heard of German planes brought down near the camp while the section was at Rozieres. Nancy, only 10 miles away, was bombarded continually by planes, and Guynemer and his gang brought down five German planes within as many days. One of the brazen German aviators that had been flying almost unmolested over Ostel learned his lesson one evening when two Frenchmen attacked him. The fight was quickly over—there was only the chatter of the insistent machine guns, then down the German came in dizzy whirls until he crashed into the ragged, black outline of the trees that lined the sunset sky. While the section was at Brenelle, a French avion landed less than half a mile from camp.

**Out of Gas**

"I'm out of gas," he explained, as he untangled himself from the maze of levers. "I've been in the air flying steadily for about 5 hr., and I just brought down the German I was after only half an hour ago! Where is the nearest place I can telephone to the airdrome?" And he trudged off across the fields to Braine.

Ducky came in from the front one day with the news that a Boche avion had just been brought down near the cross-roads *poste*. A Frenchman cleverly decoyed the German; he turned and pretended to run as the Boche drew near and went so slowly that the German evidently thought, "Well, here's a slow tub of a machine that I can shoot down




**Ambulance bodies manufactured at the Kellner body-building factory in Paris. Kellner was one of the fashionable manufacturers of motor car bodies, but now his activities gradually are being confined to airplane bodies**

without any trouble.'' But as the Frenchman drew near a white cloud, there was a sudden rat-tat-tat-TAT-tat-tat-tat-TAT, and down sailed the Boche avion in short spirals until he fell into the forest at the very foot of the bluff where the boys were watching. A second French machine had been hiding in the clouds and had pounced on the enemy machine and shot him down. The two Frenchmen, both unhurt, circled down to within 50 yd. of the treetops where the machine had disappeared to be sure that the Boche was either killed or a prisoner in French hands, then they sailed away.

''There's going to be wailing and gnashing of teeth in the Boche aviation camp tonight!'' Ducky said. ''When the first Frenchman began to run away from the German we were all cursing the Frenchy out for a coward, but he was just playing the g me.''

The official French bulletin of the next day mentioned the incident of this airplane fight.

Thursday, June 28, 1917, 11 p. m.—A German airplane, brought down by one of our aviators, fell south of the Beau Marais Wood (south of Craonne). The pilot, who was wounded, and the observer, who escaped uninjured, were made prisoners.

The importance of the airplanes as the eyes of the army impressed itself more and more on me the longer I stayed at the front. I noticed that whenever a big attack was not as successful as was hoped for, the airplanes were blamed.

''Of course the rain hampered our avions,'' an officer said, ''but there was no excuse for them not reporting that first line of fortifications. A whole system of machine gun blockhouses was not discovered at all, and when we attacked we consequently lost many more men than we should have.''

But, on the other hand, if an attack was successful, the avions received all the credit due them.

''We obtained all our objectives simply because our aviators did such wonderful work in directing the artillery,'' a battery man told me one day. ''They signalled at exactly the right time for us to lengthen the range of the curtain fire we were shooting. Usually our own shells kill numbers of our men because, as we can not see the front, we fire at too short a range when the men advance, but this time the whole system of signalling worked out marvelously!''

**Two Types of Avions**

Two types of avions flew over the lines. The observation planes—there was usually one attached to each division of 10,000 men, in addition to the others that stayed permanently in one locality—were comparatively large and slow. Consequently, they did not fly so near the front lines as the other machines for fear that a fast German plane would overtake them. They usually carried at least two men, one to act as a pilot and the other to take pictures and record other observations. The bombing machines resembled the observation planes almost exactly. If these slow planes came near the trenches, they invariably were protected by two or three little fighting planes that buzzed around their larger comrade with all the solicitude of mother birds protecting their overgrown young.

''The avions of the hunt'' were clean little machines whose duty, in addition to protecting the observation planes, was to rid the air of the German planes and make

**Railroad scene 4 or 5 miles back of the French front, showing the huge tanks of sour red wine for the French soldiers. These casks are standardized, as are the gasoline tanks on ambulances**

observations far into German territory. These light one-man machines, armed with a double potential of machine guns and lightning-like speed, were the hawks of the air that preyed on their foe with all the swiftness and agility of the fastest bird that flies.

If the airplanes were the eyes of the army, the methods of signalling from the airplanes to the watchers below were the optic nerves of the army. All the observations a squadron could make were of no value if they were transmitted incorrectly or slowly to the batteries. It was as if the retina of one's eye recorded a red color, only to have the imperfect nerves change the observation to green before it reached the brain.

Sometimes a chain of white flaming stars, visible in the brightest daylight, conveyed the messages. Sometimes the hills echoed with whistles that resembled the hoarse toot of a freight engine in the New Hampshire hills. That sound was a gigantic siren that could be heard signalling dots and dashes for three or four miles.

Some of the reports of the observations were delivered verbally or in writing at the airdrome at the end of the flights, but more often the message was tied to a stick and dropped from the machine as the aviator flew over the batteries in the fields or in the woods. Sometimes, also, wireless apparatus transmitted the messages.

Once I rushed out of the dugout at ————, wakened out of a sound sleep by an unusually loud roar of an airplane engine. My first thought was that an avion had become uncontrollable and was crashing down on the roofs of the houses, but when I reached the main street I saw an airplane only 150 ft. from the ground circling up directly over my head. A crowd of *poilus* rushed out into the street to pick up a paper the aviator had just dropped on the cobblestones, and as soon as the man in the machine above saw his message had been noticed, he turned back and sailed home. The hundreds of excited soldiers were still pouring forth from the doors of the ruined houses when an old man picked up the message, concealed it importantly under his coat and strutted down the street to the office of the Major de Cantonment. If a German avion had been flying over the town at that instant, all the carefully laid plans for the concealment of the troops in that place would have gone to naught.

But the most efficient method of signalling was the use of the machine guns. It was extraordinary how that Rat-tat-TAT-tat-tat-TAT, that resembled so much the noise of a pneumatic riveting machine in a boiler factory, could be distinguished even above the roar of the most terrific cannonading.

In one of the most successful attacks of the 66th Chasseurs on the Chemin des Dames, the six shots of the machine guns, the signal for the artillery to lengthen fire, stood out perfectly distinct from the roar of the curtain fire that echoed with redoubled volume from the surrounding hills. For that particular attack six shots from the machine gun meant ''lengthen fire,'' but the next week the whole code of signalling was changed to eliminate the possibility of the Boches ''stealing the signals,'' as football players say.

**Shells Guide Aviators**

If the airplanes returned to their camp after dark, star shells and rockets shot from the aviation field guided the machines home, and permanent lights near the hangars aided the aviators still more.

Near the *postes de secours* at the front the doctors maintained strict obedience to the rule: Keep out of sight when the Boches are overhead!

''Get out of the street with your mules!'' I heard a lieutenant shout at some muleteers at Ostel who were packing rolls of barbed wire on their burros. ''Don't you see the Boche avion?''

''That doesn't matter!'' was the careless retort.

''It does! Keep your mules out of sight till he gets over, understand? The *poste de secours* is here, and the Germans will be shelling us all day long if they see you! Get out!'' and the long-suffering *poilus* had to postpone their trip to the trenches until the buzz of the avions had died away.

When we first carried wounded from the Ostel *poste,* the ambulances could be partially concealed from the view of the avions by backing them between two ruined walls, but two months later the walls were knocked down so much more by shell fire that the boys were forced by necessity to leave their cars in the open street.

All I saw of the work of the German anti-aircraft guns was confined to watching the black puffs of shrapnel smoke that pursued the French fighting planes as soon as they got within a mile and a half of the front lines. The hollow bang of the shrapnel shells exploding in the free air was always distinguishable from the noise of the ordinary explosives fired by contact with the ground. The accuracy and speed with which the German gunners fired was distressingly good. Time after time I saw as many as thirty-four bursts of shrapnel surround a French airplane before he was within a kilometer of the lines, and sometimes the shells exploded close enough, even at this distance in the rear, to make the aviator turn, but more often the airplane merely climbed a little higher on his course toward Bocheland.

**Anti-avion Guns**

The French anti-avion guns began shooting at German airplanes the very first time I arrived at the front. The avions, flying at least 15,000 ft. in the air, were a white color that glittered now and then like the bright flash from a mirror when it reflects the sun, as the afternoon rays caught the glistening wings. But most of the time the aluminum color blended so nearly with the white and azure of the sky it took a continual straining of the eyes to distinguish them. The loud report of a French gun echoed in the adjacent field, and 4 or 5 sec. later a little white puff that looked exactly like a bit of white cotton batting appeared from nowhere far up in the heavens. Then another smoke cloud and still another hemmed in the planes, and these puffs did not melt away immediately in the air, but retained their original shape and whiteness for several minutes, hanging motionless against the blue sky.

Sometimes the Boches found some of their own anti-aircraft guns turned against their machines. At ———— I saw shrapnel smoke driv'ng home a German airplane, and it was indeed irony for the Germans not only to have their gun and ammunition captured by the French but also used against them. The dotting of the heavens by the white and black smoke puffs was the rule every day the rain was not falling.

One clear morning in June I had to stop my ambulance on the road from ———— to wait for the stretcher bearers to bring down a wounded man who had been hit in a battery on the hill. Just in back of the ambulance a French 75 was mounted on an armored motor car to use against the airplanes, so I had a good opportunity to see the whole apparatus. I never realized just how difficult it was to hit a fast-flying object like an airplane high in the air until I saw the maze of numbers, the curved lines and brass handles that made up the device for timing the shells. The polished brass mechanism was as delicate as a watch, the shells themselves would have made good parlor decorations, and the clean-cut crew that manned the guns were picked men of the French artillery. The wheels of the car were braced to absorb the recoil by two huge metallic feet that rested firmly on the earth, and a separate truck with its coat of dirt-colored war paint carried the ammunition. Fifty yards away from the gun an officer was setting up tripod with a telescope on it.

"We have observers on the tops of both those hills over there, as well as this man here," a gunner told me. "We get much better accuracy when we get the range from two or three different angles. We time two shrapnel shells at once by this machine," he continued, as he tapped the brass mechanism on the ammunition truck. "We don't have time to change the adjustment at every shot, so we do it every two shots."

"What do you do at night?" I asked. "I shouldn't think you could see to shoot."

"We have a special gun that shoots star shells up into the air, and we also use powerful electric searchlights," he answered.

At Brenelle there was a smaller type of avion guns, two cannon in a battery, each mounted on an armored car. Ten yards away a well built dugout constructed of sand bags and timbers was the quarters of the men, and just as I arrived I heard the tingle of the telephone connected with the observers' stations in the distance. The buzz of a German airplane was faintly distinguishable, but evidently the avion was out of the range of this battery, for the man who answered the telephone call went back to his work of pounding decorative designs on an empty shell casing. Another soldier with a pair of binoculars slung across his shoulders, came up and told the boys to get out without ceremony.

"It's against the rules to be hanging around here," the man said. Then he caught sight of my camera. "No, you can't take a picture either."

But this rather unexpected strictness was soon accounted for. As I walked dejectedly down the road I passed a fierce looking captain driving up toward the guns in a dog-cart.

Less than a week later, another anti-avion battery let a German airplane shoot down a sausage balloon without firing a single shrapnel shell. Soon after this incident I saw the stout figure of the same artillery captain in command of the other battery gallop down the street with indignation written in every movement to investigate this laxity on the part of the gunner. I smiled wisely to myself.

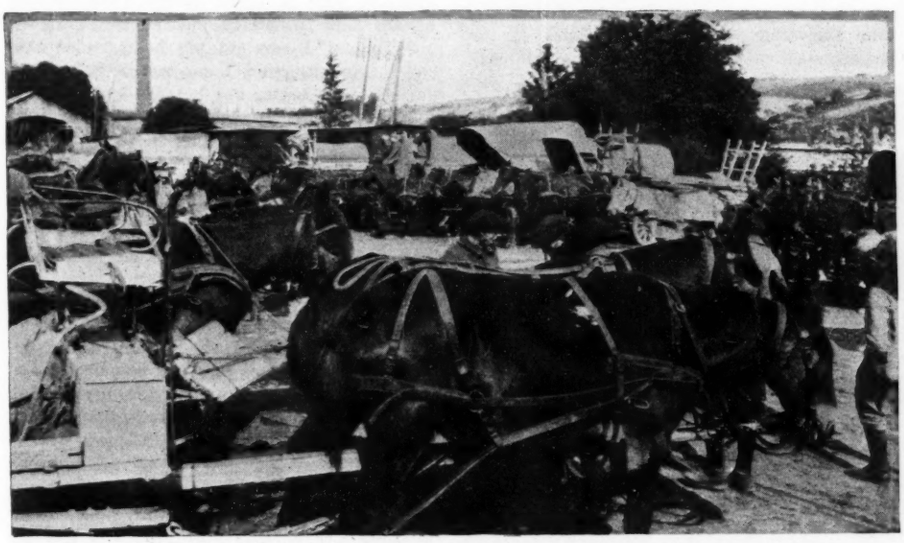
In six months on the front, I never saw an airplane, French or German, shot down by an anti-aircraft gun. Once I read of a direct hit by shrapnel in an illustrated newspaper. But the journal published a whole page of photographs illustrating the "extraordinary occurrence" and seemed to attach so much emphasis to the unusual nature of the accident that I judged the guns very rarely made a hit.

**Cost of Direct Hit**

I heard—and believed—the story that it costs 1,000,000 francs for every German airplane brought down by a direct hit from an anti-aircraft gun, and I soon learned that the function of the contra-avion cannon is not so much to hit the planes as to keep the planes high to keep the observers from seeing the details of the military works below. Shrapnel always carries a threat for the enemy if he flies low, and this threat at least keeps him worried.

I discovered also that the machine guns on the airplanes were used for more than the two purposes of signalling and attacking other airplanes. The use of the machine guns to shoot directly on the front line developed to such an extent on the Chemin des Dames that it carried with it a very formidable threat. The Boche—and French as well—swooped like rockets straight down at the men in the trenches, and emptied whole magazines of bullets at the infantrymen who fired futilely back at this new terror from the air. These attacks were reported not once but many times, and the fear instilled in the men that had been wounded by the airplane guns told plainer than words just how terrible the threat was. The Germans began this system of warfare, but the French soon retaliated and beat the Boches at their own game.

One German aviator in particular made himself unpleasantly conspicuous by not only attacking the trenches but also shooting at every light he saw at night. When the Ger-



**Railroad 5 miles from the front line trenches. Each morning the convoys arrive to take provisions, munitions, etc., to the trenches. The traffic is as great as in Chicago or New York**

man began to fire, the French always could tell he was coming, for German machine guns fire much slower and more irregularly than the French.

One evening in the quarry that served as the *poste de secours* at ————, the burlap curtain that was drawn over the airshaft to keep the lights within from showing accidentally fell down unnoticed by the soldiers in the abris. Suddenly the deafening roar of an airplane engine and the familiar crack of the machine gun interrupted the card game, and as we sprang back from the table, several bullets patted against the earthen floor. Luckily no one was hit during this attack by the German aviator, but every evening thereafter the head doctor of the dressing station personally inspected the burlap screen to see that it was in place.

The most effective threat from the French and German avions was that of airplane bombs. Airplanes were used for more than eyes of the army, for even with the best observation, tens and perhaps hundreds of shells fell harmlessly on empty fields where one took effect. When the avions dropped explosives directly on their target, a serious loss of life invariably resulted. In Paris and London elaborate systems of signalling were employed to warn the people of the approaching airplanes. Sirens shrieked, bells rang and whistles made the nights hideous, and even in the smaller villages the same precautions were observed to warn the inhabitants. Every house that had a cellar beneath it always had a sign on the outside reading, "Cave in case of bombardment," and had a large red arrow painted on the door to point to the entrance. Black arrows always indicated the nearest source of water, but red ones invariably denoted the *abris*.

**Soldiers Driven In**

In the sections of the country near the front, and especially where bombing parties were of frequent occurrence, the soldiers were not quartered in the regular army barracks placed in the open on high well-drained ground. The *poilus* were driven indoors, forced to sleep in dark, unhealthy, germ-infested stables and cellars because of the danger from the air.

The reason that the munitions, even many miles in the rear, were piled in small, widely separated piles, was because the officials did not want the whole supply of ammunition to explode in case an avion bomb blew up one pile.

Whenever we heard a soldier say, "This is a great avion country around here," the news spread like wild fire, and the camp expected visitors from the air every clear night. Some of the Frenchmen maintained that the airplanes could not see or be seen farther than 100 yds. or so distant, but one night the boys learned better. Early in May I was awakened by a dull booming of guns and the sharp rapping of machine guns. I knew what that meant, another German raid.

"A Boche just dropped bombs only half a mile away!" Wally shouted up from a street below the garret where we slept. "Come on out and have a look at him!"

I snatched my woolen vest and heavy overcoat and ran up the hill just outside the cantonment in the midst of an excited crowd of Americans at least half of whom were in their pajamas.

"There he is!" someone cried, and by straining my eyes I could see, dimly outlined against the moonlit sky, a black dot twisting and turning until it vanished in the north.

The threat of the avion bombs was so very real at ————, that a great French field hospital that had just been installed with elaborate pains after three weeks' work had to be dismantled again and moved to a locality farther to the rear. At this place the Boches dropped bombs in broad daylight, but as a rule, especially if their objective was over a mile or so in back of the French lines, the avions confined their bomb-dropping activity at night.

Every French airplane camp had a well constructed dugout within a few yards of the airdromes, for the airplanes had a habit of playing tit-for-tat and dropping bombs on the bombers.

When darkness settled on the camp of section five at the front "Lights Out" was the invariable rule. Many times there was not the faintest buzz of an avion to disturb the heavens, and often rain clouds hung low overhead.

When the hum of the airplanes did float down from the blackness above, a curious uneasy, helpless feeling came over every member of the section. Sleep was out of the question, and we became far more frightened than they ever did from the shriek of the largest shell. It became almost an impossibility to concentrate on doing any consecutive work. All of us wandered aimlessly about the camp, talking in monosyllables and forgetting everything. We forgot to finish brushing our teeth with the tooth brushes we had in our hands; we forgot to fill the water buckets that lay at our feet—the only thing we could think of was the possibility of several hundred pounds of high explosives dropping on us any instant.

I woke up about 10 o'clock in the evening to find myself holding my enamel wash basin firmly on top of my head. Before I had even awakened I had reached under my head and put on this improvised helmet. By the time I had fully recovered consciousness, the buzz of the airplane engines was very loud overhead, so I hopped off my cot barefooted and went out under the trees. The anti-aircraft guns in back of the camp cracked, and I heard the zing of the shell whistle and saw a moment later the starlike flash of the bursting shrapnel far up in the sky. Then a fragment of the shell casing came humming and buzzing down through the trees and fell through the branches between two of the boys' tents. Needless to say, I clutched the wash basin even tighter as I leaned against the trunk of the tree. Everybody in camp was up by now, some talking in low excited voices and others watching the broad beams from three great searchlights sweep the sky slowly from left to right. The battery of these lights was less than a quarter of a mile away and evidently near another group of anti-aircraft guns, for the blinding flash from the cannon blotted out even the glare of the searchlight every minute or so. Charley Guy drove into camp just at this time with a disabled car, and he was just setting up his bed in the open when the avions came over.

**No Safe Place**

"I see where I don't sleep out here tonight," was his first disgusted remark. "What're you trying to do over there, Rover?"

Rover, the 6-ft. giant of the section, had been asleep inside his car, but now he was busily spreading his blankets underneath his ambulance.

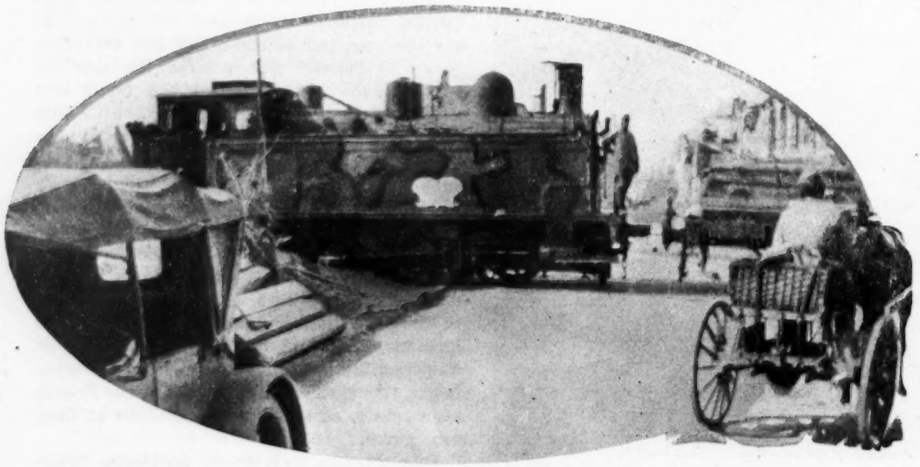
"I want to be near the ground if any more of that shrapnel comes down on top of me," he yelled in answer to Charley's question. "I can get my head under this cover this way, and I can see the avions a darned sight better out here!"

The hum of the machines grew louder and died away again four times in the next half hour, but finally the sound stopped completely, so I crawled back into bed again to snatch a few hours of troubled sleep.

During the next week the continual rain kept the Germans from coming over the camp for several days in succession.

The havoc wrought by the avion bombs forced its attention on us everywhere. Even far back of the lines the section passed by the smoldering ashes of what had once been great stacks of wheat, but the bombs destroyed far more valuable things than inanimate grain.

Chef Michel came back from his permission at Nancy time after time with the news that the German airplanes bombarded the town every clear night, with a toll of dead and wounded that included not only soldiers but also many women and children.



**This camaflage is painted on an extra steel sheeting or armor plate which protects the boiler of the locomotive. The photograph was taken 2 miles from the front line trenches**

The very first wounded man I carried in my ambulance had a splinter of avion bomb in his arm, but although I had seen the airplane that dropped the explosive and was actually sitting next to the pale-faced boy when the sergeant brought the bandages to bind the wound, I did not realize then the full danger from the air.

At Coincy I heard the avions had killed several civilians and soldiers in Fismes and also in Fere en Tardenois, only 5 miles distant, but I only laughed then at what an old Frenchman said.

"It's all right to laugh at the bombs," the man said in a quavering old voice above the rattles of the machine guns that disturbed the night; "but the bombs are much more serious than you imagine. Just wait till one comes near you."

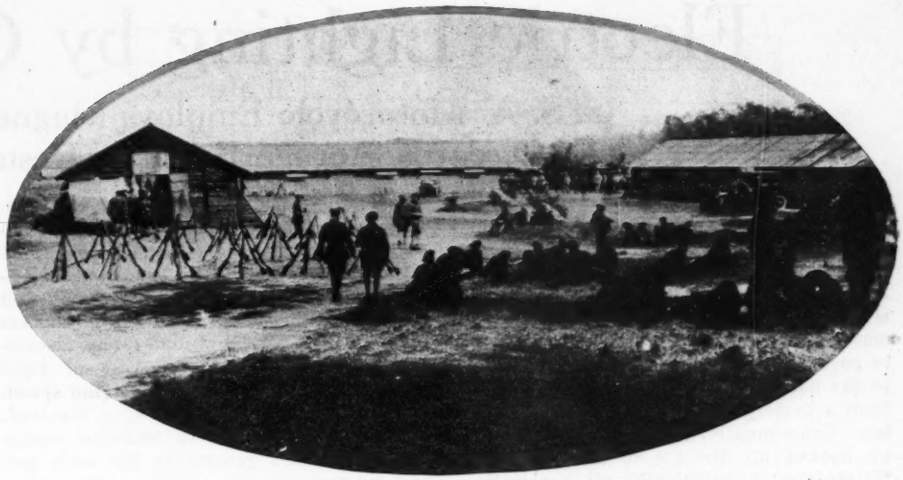
True realization of the danger finally came to me at ———— where the Boches bombed the hospital twice in one day. When the airplanes came over the first time, the funeral of a French lieutenant had just started from the hospital to the military grave on the hill nearby. A priest, dressed in his gown of white, edged with a broad band of black, was walking ahead of the two-wheeled cart that carried the coffin. The tri-colored flag of France covered the rough pine box, and a detail of thirty soldiers with helmets and gleaming bayonets walked on each side of the car as an escort. The procession had hardly left the hospital grounds when a series of terrific explosions made my heart almost stop beating. A fragment from one of the bombs struck the top of my ambulance and fell at my feet less than a foot away as I stood in the doorway of the tent hospital.

In less than 5 min. a call came in for Hump Parsons, who drove the first ambulance to leave, to come down to a field and fetch a man who had been wounded by the bombs.

**Victim of Attack**

The ambulance soon returned with an old farmer who had been working in the fields when the airplanes were overhead. He was shrieking at the top of his lungs, "Don't cut off my leg! Don't cut off my leg!" while the surgeon's assistants cut off his blood-soaked overalls from his leg, and his daughter stood helplessly in the door of the hospital while the doctors were bandaging the wound, twisting in her hands the straw hat that her father had worn only 10 min. before. The discolored straw had a clean gash 4 in. long in its brim where another piece of steel had shot past the man's head without touching him. If the fragment in the leg had gone half an inch farther into the knee, the surgeons would have had to amputate the limb, so there was more sense than I thought to the man's frightened screams.

The second airplane attack of the day was much more serious. I had just lain down on a stretcher in the shade of a tree to snatch a few minutes of sleep, when I heard the unmistakable hum of the German airplanes. I was frightened because of the attack in the morning, but I did not think of the possibility of another raid on the same day. The avions were not yet in sight when I sat up, and as none of the Frenchmen was paying any attention to the sound I lay down again, while the hum grew louder and louder. Suddenly a shriek like the whistle of a shell, then a terrific explosion made me roll off a stretcher and huddle close to the ground. Once I started to stand up, but another shriek, then another and another, forced me back to earth. When the bombs finally stopped dropping, I found myself lying flat on the ground in a tight embrace of a French ambulance driver who had been sitting at my side.



**Encampment of French Chausseurs 10 miles behind the lines, typical French army barracks. They are made collapsible so as to be transported on motor trucks, and each building will accommodate 150 men**

"A piece of bomb dropped right here," the Frenchman said, and with true French curiosity forgot all about the airplanes and began to scratch away at the dirt and grass in the bank in his search for the *éclat*. I felt my cheek. A curious bloodless scar about half an inch long made a mark just below the cheekbone. The Frenchman smiled a sickly grin, but even that apology for a smile disappeared when he glanced up the street between the barracks. A procession sadder even than the funeral that had left the hospital a few hours before, was slowly approaching: it was the victims of the air raid, men who had been struck only 200 ft. away from the ambulances. At first I thought the men were merely scratched, but in a moment learned from a priest that two men had been killed and six badly wounded.

"Get ready to leave at once!" the doctor directed, and I overheard them say that the danger of another attack from the air was so great that all the *blessés*, whether seriously wounded or not, were to be evacuated to a hospital farther back the lines.

That night after the excitement and exertion of the day, I sat down outside his tent and realized the truth in the words of the old man of Coincy.

"Wait till one comes near you!" the Frenchman had said—and one had come quite near enough. Just across the river that white hospital still gleamed from the rays of the setting sun, and the rippling stream that ran down the valley this side of the tent seemed to separate life and death. On one side of its banks I had seen life end with shocking suddenness that day. But on the other side all was peaceful—so peaceful that even the careless conversation of my comrades seemed a sacrilege.

Two days after this double avion attack on the hospital at ————, the Boche airplanes dropped two bombs simultaneously near the *poste* at ———— less than 200 yd. away from where the boys were sleeping. The *éclats* chipped pieces of stone from the old tower that served as a dug-out, and the next morning I walked across the field to investigate the damage. The explosion had been so terrific that it had gashed a hole in the earth large enough to make a cellar for a house. The bottom of the pit was all of 15 ft. from the surface of the field, and the hole was at least 25 ft. long and 12 ft. wide.

One of our men who had been back to America and returned to the front after an absence of a year was dumfounded when he looked at the enormous hole.

"These bombs are twice the size of the ones they used around Verdun last year," he said, "and they're shooting 'em more accurately than they did then. We used to welcome a bombing party because it gave us a little bit of excitement to help pass the time away, but this kind of excitement looks too much like danger to me!"

One of the bombs that fell near the hospital at ———— failed to explode, but a conspicuous sign that read, "Forbidden to touch," kept inquisitive fingers from the steel casing. I felt no inclination to handle that gigantic cast. From the tip of the fuse to the end of the tail was almost 4 ft. Six tin-shaped steel wings projected back from the body of the bomb to keep it from turning end over end on its downward path, and the high explosive was still inside the casing.

**Plenty of Excitement**

Soon after the section left the front at this time, I met a friend who had been in another ambulance section. .

"We have been having some excitement with avion bombs lately," I said.

"Don't say a word!" Tubby answered. "Only last night one of our men was sleeping in a house 4 miles from the lines, when an avion bomb came in through the window. They're having his funeral just about now."

During the very next action my tent was pitched within a rod of an enormous mound of earth 50 ft. long and 15 ft. wide. The sign in front of the grave said, "Thirty-three horses buried here." And I knew the story of that air raid. I remembered the lieutenant's words when he came into camp one night:

"Avion bombs killed a man and over thirty horses in the raid last night. The soldiers are burying the remains now just over the hill, and we're going to get out of here before the Germans come over again."

# Electric Lighting by Generator

## U. S. A. Motorcycle Employs Magnetic Ignition and Discards Storage Battery—Results of Tests

IN the development of the new U. S. A. motorcycle it was decided to employ magnetic ignition and also to fit a small electric generator for generating current for electric lighting. No storage battery is to be used, as it was feared that the motorcycle riders in the field would not be in position to give the necessary attention to the battery and that under these conditions a battery inevitably would give trouble. Consequently, the lights will have to be hooked up directly to the generator. Heretofore in practically all automotive electric lighting systems a storage battery has been floating on the line. Such a battery has a powerful steadying influence, boosting the line voltage when the generator drops below normal speed and pulling it down when the generator exceeds this speed. With the battery eliminated the problem of maintaining the voltage sufficiently constant to insure a tolerably uniform light at all engine speeds is complicated seriously. Not only must the voltage be maintained approximately constant throughout the generator speed range, but there must be no excessive flicker which might be due to the action of the voltage regulating or control device.

**Specifications in January**

Specifications of the generator desired were drawn up by the Military Motorcycle Standardization Board and submitted to manufacturers of electrical equipment throughout the country during the latter part of January. It was stipulated that the machine must be of round section, not over 3¾ in. in diameter. It was to be clamped to a saddle cast on the crankcase, telescope into the driving gear housing and bolt against same by three ¼-in.—28 S. A. E. screws. The generator was to be driven at twice crankshaft speed, was to supply current to one 15-cp. headlamp, one 2-cp. taillamp and one 2-cp. sidecar lamp, and its voltage must be maintained so that lamps would not blow under any circumstances. A reasonable amount of light must be given at 500 r.p.m. engine speed. Shaft and dimensions also were specified.

Four manufacturers of electrical equipment submitted generators for tests and had representatives on the scene when these tests were made.

Generator A is $3\frac{7}{32}$ in. in diameter and weighs about 6 lb., including its control mechanism, which is inclosed within the generator housing. Control is by a regular voltage regulator, comprising a magnetic vibrator, shunt coil for operating same and a field resistance which is cut in and out by the vibrator. This regulator operates in conjunction with a third-brush system. The regulator resistance is located at the commutator end of the generator under the cover. As all the regulating devices are inside the generator and the latter is wound for a ground return wiring system, there is only a simple binding post or terminal on the outside.

A somewhat different control system is used on generator B, which is $3\frac{7}{16}$ in. in diameter, 6¼ in. in length over all and weighs 7¼ lb. Like type A it is of bipolar construction. The regulating mechanism comprises a vibrator with two contact points. One of these contact points is being vibrated by a cam or rather an eccentric on the end of the armature shaft, while the other contact point is drawn away from the vibrating one by an electromagnet energized by a coil connected across the armature. The higher the voltage generated the more the contacts are being kept apart by the electromagnet and the less the field resistance is cut out. High speed of the cam also tends to reduce the time of contact and thus to keep down the voltage. This regulator is mounted on the end plate at the commutator end.

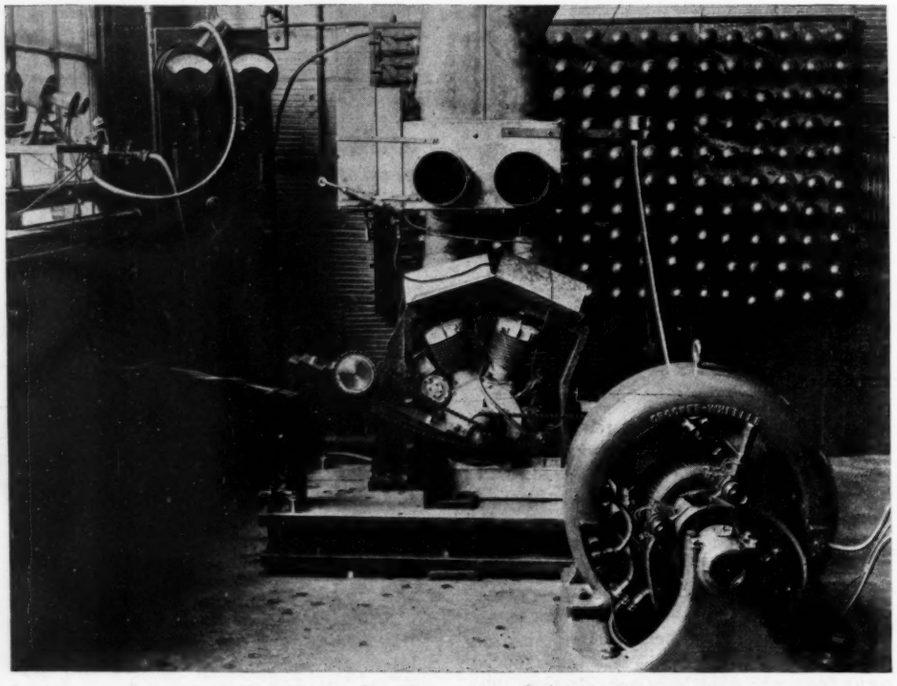
Generator C has a straight voltage control. However, the control resistance in the field circuit is divided into two parts and there is a double vibrator, so arranged that when it is actuated moderately only one contact set will open and one part of the resistance be cut into the field circuit, whereas if the actuation of the vibrator is more energetic both contact sets will open and the whole of the resistance will be cut into the field circuit. This generator is of four-pole construction with series armature winding so arranged that the two brushes come on top of the commutator. The machine is 3¾ in. in diameter and weighs approximately 10 lb. with regulator.

**Regulator of Usual Type**

Generator D is $3\frac{7}{16}$ in. in diameter and weighs 9.8 lb. It is of four-polar construction with series-wound armature, one brush being at the side and the other at the bottom. The regulator is of the usual vibrator type and is located in a circular housing on top of the generator which can be removed readily if desired. As all the screws holding the end plates in place are lead-sealed the generator cannot be tampered with. The armature is coil wound and impregnated with Bakelite.

All the generators are fitted with ball bearings. All the generators were installed successively on a U. S. A. cycle engine, connected to a load consisting, first, of one 12-cp. headlamp and two taillamps, then of one headlamp and one taillamp and finally of one tail lamp only, and the engine with each of these loads was run at various speeds from 500 to 3600 r.p.m. inclusive. At each speed ammeter readings were taken and the character of the light given out by the headlamp was noted. The ammeter hand would not stand steady but swing more or less and the extreme points reached in its swings were noted.

It may be pointed out that these tests will not be the sole basis for selecting one or more types of generator for use on Liberty motorcycles but are preliminary to extended road tests. The object was to test the generators on the engine to which they are to be fitted throughout the whole speed range of same and bring to the attention of the makers at the earliest possible moment any defects in design, so that these might be remedied before the final tests are begun. It was realized that the design of a variable speed, variable load constant voltage generator is a comparatively new problem and that perfection would not be attained at once. The results shown by the



One of the U. S. A. motorcycle generators mounted on the engine for a test

tests are, however, quite encouraging and there is absolutely no doubt that a thoroughly practical outfit will be secured.

The results of the tests are given in the accompanying curves. In plotting the curves the mean of any pair of voltage readings was taken. On full load very good results were obtained with three of the generators, A, B and C. Generator D, with plain vibrator voltage control, gave a rapidly increasing voltage about 2400 r.p.m. engine speed. The reason is believed to be that from about this speed the vibrator keeps the field resistance in circuit all the time so that the voltage rises with the speed.

Generator B and C also showed up well on the slightly reduced load, headlamp and one taillamp. The voltage of generator A dropped away rapidly from about 2000 r.p.m. engine speed on.

When loaded with only a single taillamp generators B and C again maintained their voltage quite well throughout practically the whole range of engine speed. At the upper end of this range both increased considerably in voltage, that of generator C reaching 10 volts at 3600 r.p.m. This speed would never be attained by the engine in riding, so that this sharp rise in voltage, which is further contingent upon only a single 2-cp. lamp being in circuit, is of little importance.

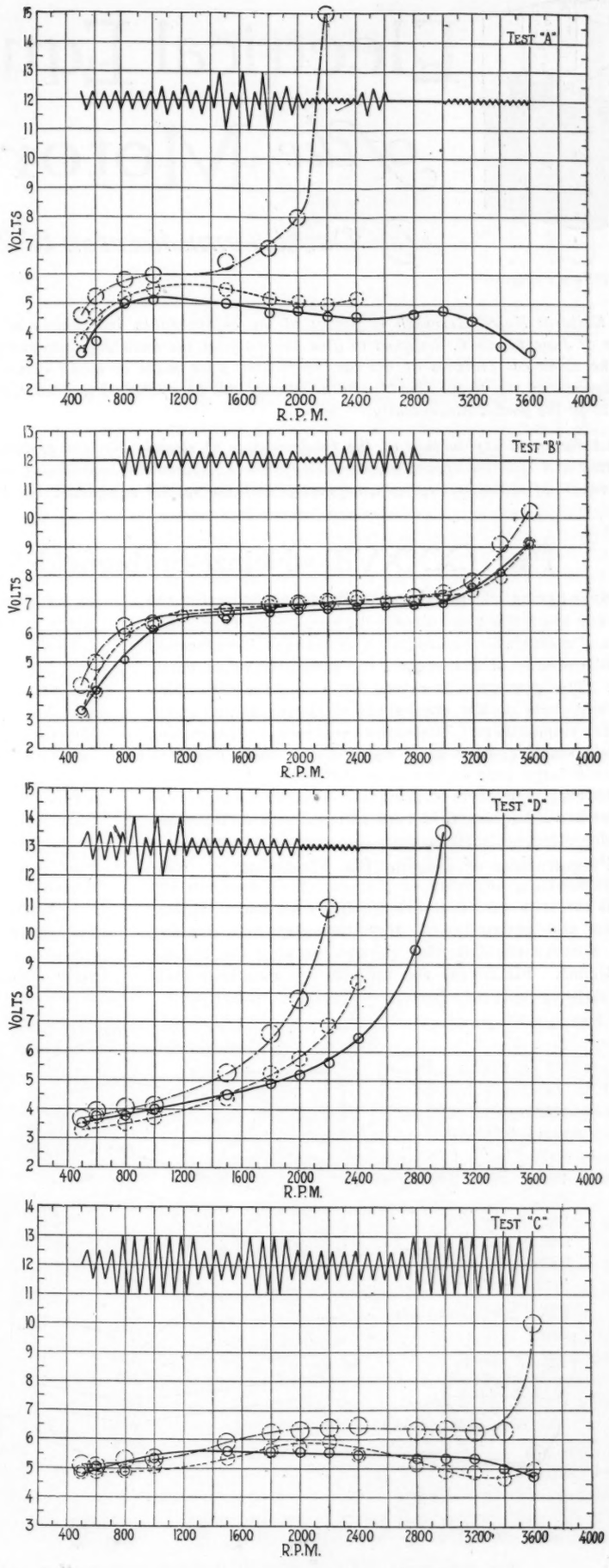
**Trouble at High Speed**

The voltage of generator A, when applying only one taillamp takes a sharp upward turn at about 2000 r.p.m. engine speed, and this speed could not be much exceeded without burning out the filament. The same trouble occurred with generator D. In the case of generator A the probable reason is that since its control is based in part on the constant current principle, third-brush regulation, when the lamp load is greatly decreased too much current will flow. Generator D probably has too small a field resistance.

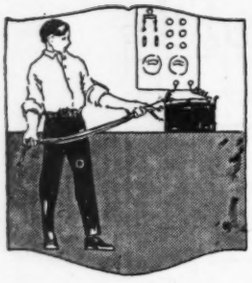
These observations relate to the variation of the voltage with engine speed and generator load. Preferably this variation should be nil, but in practice such a result is unattainable. Too low a voltage, of course, means a dim light, while too high voltage means the burning out of bulbs.

Besides the gradual variations in voltage due to variations in engine speed there are rapid-variations which may result from the action of the voltage regulator or from engine vibration. Such rapid fluctuations in voltage result in a flicker or in periodic variations in the intensity of the light, which under certain circumstances may be quite annoying. As the test runs with full lamp load were made an observer noted the character of the light given out by the headlamp and in the diagrams the character of the light is denoted by symbols which are really self-explanatory.

(*Concluded on page 47*)




**The upper records in the generator test charts indicate character of light, whether shady, fluctuating or wavering. The full line curves show voltage on full load with headlamp and two lamps; the dashed curves show voltage with headlamp and one small lamp only; the dash-dotted curves show voltage with one lamp**



# Electrical Equipment of the Motor Car

By David Penn Moreton & Darwin S. Hatch.

*Editor's Note—Herewith is presented the eighty-eighth installment of a weekly series of articles begun in* MOTOR AGE, *issue of June 29, 1916, designed to give the motorist the knowledge necessary to enable him to care for and repair any and all of the electrical features of his car, no matter what make or model it may be. At the conclusion of this series, "Electrical Equipment of the Motor Car," with additions, will be published in book form by the U. P. C. Book Co., Inc., New York, in a size to fit the pocket conveniently.*

*A thorough explanation of the fundamentals of electric circuits preceded descriptions of the general types of starting, lighting and ignition apparatus, signalling devices, magnetic transmissions, etc. This is being followed by the installation, care and repair of individual systems, beginning with the special equipment for Fords.*

## Part LXXXVIII—Heinze-Springfield System for Ford Cars

THE Heinze-Springfield starting and lighting system for the Ford car is of the two-unit, 6-volt, single-wire type. The generator and motor are mounted on a special bracket attached to the left-hand side of the engine, the generator being below the motor. The generator is driven by a silent chain which runs over sprockets on the crankshaft of the engine and generator shafts respectively. The motor is geared to the engine, when used in starting, by a Bendix drive, the pinion of which meshes with a large gear on the generator shaft and the same silent chain that is used in driving the generator. One type of generator has a bucking field type of regulation and another type has electromagnetic regulation.

### Preparation of Engine for Mounting

Before dismantling any part of the car, check over the bill of material to make sure that every part is on hand. Adjust the ignition and carbureter so that the engine is running smoothly. Remove the following parts, observing the precautions mentioned. Disconnect the radiator by removing bolts on each side, remove the rod, water connections to engine and wires to the headlights. The water outlet pipe should be disconnected from the hose, after the radiator has been removed and discarded. Remove the fan and starting crank, fan belt and fan bracket. Remove the fan pulley from the crankshaft and discard the pulley and pin and cotter pins. Next remove the timer, or commutator, and disconnect the rod from the timer case. Place the commutator case back along the side of the engine after it is removed, but do not disconnect the wires. Remove commutator brush assembly, after noting carefully the exact position of the brush, and do not turn the engine over while the brush is removed. If the brush is replaced carefully in its original position when reassembling, the timing of the engine will not be altered.

The timing-gear cover, or cylinder front cover, now should be removed, retaining all the bolts, the nuts, the gaskets and the cotter pins for replacement in mounting the main bracket plate supplied as part of the Heinze-Springfield equipment.

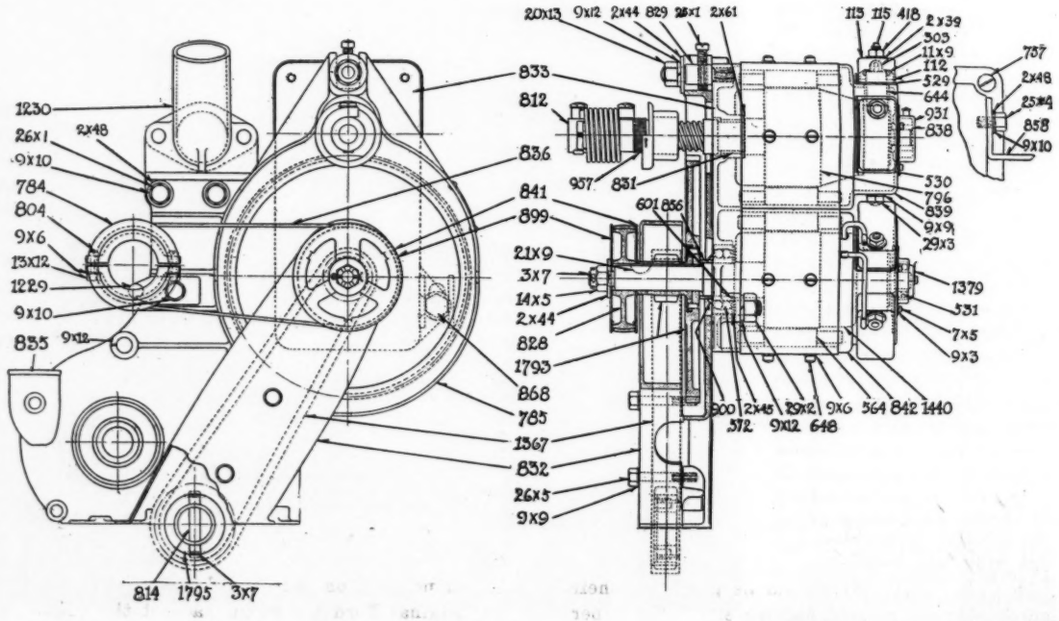



*Fig. 486—Front and side views of Heinze-Springfield motor and generator installed on Ford car*

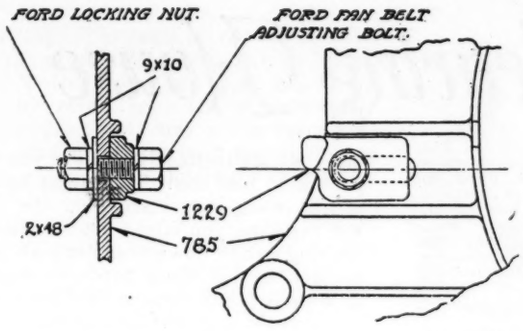



*Fig. 487—Correct assembly of belt tightener for Heinze-Springfield installation on Ford car*

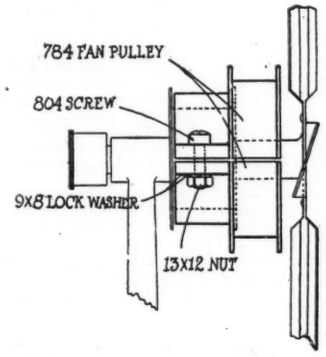



*Fig. 489—Special fan pulley for Heinze-Springfield installation on Ford car*

It is necessary to remove the felt washers around the openings in this timing-gear cover for the crankshaft and camshaft and place them in the corresponding openings in the new bracket plate which is to take the place of the cover. If the car has seen considerable service, it is advisable to replace these washers with new ones to prevent a leakage of oil from the crankcase.

Secure the Heinze-Springfield water-outlet header, 1230 in Fig. 486, in place on the cylinder head casting, using the original Ford bolts and gasket. Place the fan-belt tightener, 1299 in Fig. 487, with the nose away from the large gear housing, in the slide provided for it on the main bracket plate 785. Remove the fan adjusting screw and locking nut from the Ford cylinder front cover and use same, together with the two lock washers, 9 x 10, and plain washers, 2 x 48, to secure this tightener as shown in Fig. 487. Set the main bracket plate in position on the Ford engine, and bolt securely in place, using the original Ford paper gasket, cap screws, bolts, nuts and cotter pin. Be sure to tighten all bolts securely to prevent oil leaks. Then bolt the main bracket plate 785 to the water outlet header 1230, using the two, 25 x 4, bolts, 9 x 10, lock washers and 2 x 48, plain washers as shown in Fig. 486. The commutator brush assembly and commutator now may be replaced, taking particular care to put them back in their original position. Connect the commutator advance rod back in position.

## Installing the Electrical Units

The combined generator and starting motor unit should be placed in position on the main bracket, plate 785, with the chain adjusting stud 829 in place on the electrical unit, as shown in Fig. 486. The chain adjusting stud 829 should rest freely in the bottom of the slot at the top of the main bracket plate 785. Assemble on this chain adjusting stud 829, plain washer, 2 x 44, lock washer, 9 x 12, nut, 20 x 13, and screw, 25 x 1. Be sure that the shoulder of the chain adjusting stud 829 is turned up tight against combined head 833. Place the lower adjusting bolt 868 in the slot provided for it on the main bracket plate 785. A lock washer, 9 x 12, and nut, 29 x 2, are provided for this bolt, and they should be placed in their respective positions. Do not, however, tighten either the upper or lower chain adjusting bolts at this time.

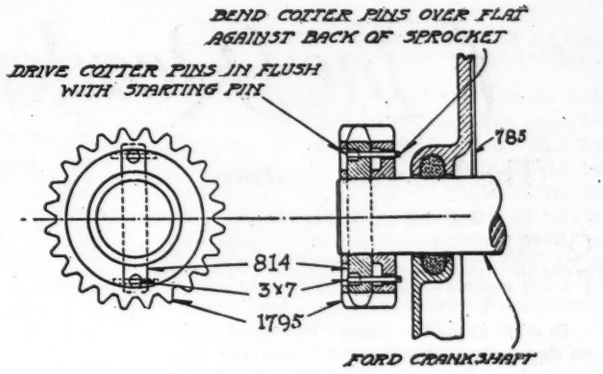



*Fig. 488—Correct assembly of cranking sprocket for Heinze-Springfield installation on Ford car*

While the electrical unit is mounted loosely in place, the chain may be installed in the following manner. Place the generator shaft spacer 856 and the Woodruff key, 21 x 9, on the generator shaft, Fig. 486. Also place the gear and sprocket assembly 1793 on the generator shaft, so that the large gear is on the inside toward the main bracket plate 785. Place the chain 1367 around the crankshaft sprocket 1795, and also place the chain around the small sprocket now on the generator shaft, taking particular care that the open side of the crankshaft sprocket is toward the front of the car. With the two sprockets and chain in this position, slide the crankshaft sprocket 1795 and gear and sprocket assembly 1793 into place on the crankshaft and the generator shaft respectively, taking care that the starting-pin hole in both the crankshaft and crankshaft sprocket are in alignment. Insert the starting pin 814, Fig. 488, with the counter bore for the cotter pin toward the front of the car. The holes in the starting pin are to align with the holes in the rear wall of the crankshaft sprocket. When the two cotter pins, 3 x 7, are in place, it is necessary that their ends be bent over against the rear face of the crankshaft sprocket while they are held up tight in the holes. Unless they are fastened in this manner, which permits no end movement, their ends are liable to be broken off and allow the starting pin to come out, which would result in very serious damage to the entire system. Tighten the chain by the fillister head cap screw, 25 x 1, in the upper chain adjusting stud 829, Fig. 486, until it is reasonably tight and securely lock the unit in position by the holding stud nuts, 20 x 13, and 20 x 2.

The chain cover 823, Fig. 486, next is to be placed in position and should be fastened with cap screw, 26 x 5, and lock washers, 9 x 9, to the bracket plate.

Place one of the fan-belt guards 841 on the generator shaft, with the three projections toward the front of the car, then assemble the fan-belt pulley, 828, against this guard and complete fan-belt-pulley assembly with the other fan-belt guard 899, this time, however, placing the three projections toward the rear of the car. This assembly should be locked securely to the generator shaft by the use of the plain washer, 2 x 44, the castellated nut, 14 x 5. The cotter pin, 3 x 7, then must be placed through the end of this shaft to lock this nut.

Next install the motor rear stiffening bracket 858, Fig. 486, as follows: Bolt the bracket 858 loosely to the cylinder head with the bolt taken out and also start the bolt, 25 x 4, Fig. 486, fastening the bracket to the motor brush head, but do not tighten. First tighten the bolt on the cylinder head, thus connecting the bracket rigidly to the Ford engine. Then tighten the bolt securing the bracket to the motor brush head. Do not be afraid to file the bracket so it will fit.

Assemble the two half pulleys, 784 in Fig. 489, over the Ford fan pulley and fasten them in place. With this new fan pulley the belt will run closer to the blades than before. Mount the fan in position on the main bracket plate 785, Fig. 486, using the original Ford screw, and adjust the fan belt 836 over the two pulleys to the proper tension.

# The Readers' Clearing House

## The Electric System

### Starting on Batteries

Q—If I arrange to start off dry cells when cranking my car by hand, will it start any easier than it will off the magneto? Of course I would use the same transformer coil.—C. M. Smithson, Winchester, Ill.

In most cases the engine will start easier on dry cells and coil than where the magneto alone is used. This, however, is not true of all magnetos, as some of the modern instruments give a very hot spark even when turned quite slow in cranking.

### Overhauling Storage Battery

Q.—When overhauling a storage battery, should the plates be kept in water all the time? Can I burn the connectors on with a welding torch? Do I have to empty the solution out before applying a flame on the battery?—O. Sneen, Leland, Iowa.

Before disassembling a battery it should be recharged and then have the electrolyte syphoned out of it. If the plates are thoroughly dry it is not necessary to keep them in water. The connectors can be burned on with a welding torch. In doing this work the top of the post should be melted first and the connector fused to it. Then fill in the joint with a burning strip of lead.

### Changing Magneto Rotation

Q.—I have a Bosch magneto, set spark, Model DU4, anti-clockwise, and would like to change it to clockwise. Is the breaker assembly all that I will have to replace and will it be necessary to change the position of the breaking lugs; there are holes for making the change as well as change the distributer gears to the notch marked C?

2—How many degrees or how many inches on the rim of the flywheel of a Buick 25 should I advance the spark setting of this magneto to procure best results in average touring?—Marshall D. Palmer, Mason City, Iowa.

1—You can make the change from anti-clockwise to clockwise by putting on a complete contact breaker assembly for right-hand magneto. Also the segments or cams will have to be changed as you mention. To complete the job it is necessary to remesh the gear on the rear of the armature and distributer gear wheel so the break occurs with the armature in the position shown in Fig. 1. The distance should be from 14 to 17 mm. The illustration is made viewing the magneto from the driving end. The distributer gear will rotate in an opposite direction from what it did before the change, hence the wires going to the plugs must be interchanged so the cylinders will fire correctly.

The numbers 1, 2, 3 and 4 do not represent the firing order of the engine, but the order in which the carbon distributer brush makes contact with the metal segments, according to whether the magneto is running clockwise or anti-clockwise.

2—To set the magneto for best results on your car proceed as follows: Having fixed the magneto to the engine the driving pinion is put loose on the cone of the magneto spindle, the current conducting spring removed, also the dust cover, to determine the position of the armature. The engine now is turned by hand until one of the pistons is at the end of the compression stroke exactly on dead center. Then place the armature in the position shown in the illustration. Having done this tighten the pinion on the spindle, taking great care not to alter the position of the armature. Then replace the wires going to the plugs.

**TO assist readers in obtaining as a unit all information contained in this department on a certain subject in which they may be most interested, such as ignition, carburetion, etc., MOTOR AGE has segregated inquiries into classes of allied nature. Questions pertaining to engines will be answered under that head, and so on.**

**THE ELECTRIC SYSTEM**

C. M. Smithson.....Winchester, Ill.
O. Sneen.....Leland, Iowa
Marshall D. Palmer...Mason City, Iowa
Thomas W. Wilkerson.....Blanco, Tex.
L. Orchard.....Adelaide, Australia

**ENGINES**

Subscriber.....Moline, Ill.
Reader .....Detroit
George Huycke.....Topeka, Kan.
C. M. Smithson.....Winchester, Ill.
O. Sneen.....Leland, Iowa
Frank S. Johnson.....Kendallville, Ind.

**CARBURETION**

T. T. Taynor.....San Antonio, Tex.
R. M. Marlow.....St. Louis, Mo.
Walter E. Click.....Elkhart, Ind.
J. G. Koppel....Sault Ste. Marie, Mich.

**MISCELLANEOUS**

E. Sanchez Marti.....Havana, Cuba
E. R. Carpenter.....Brooklyn, Iowa
Subscriber.....David City, Neb.
Subscriber.....Zeeland, Mich.
J. B. Sears.....Waverly, Ill
L. L. Cambre.....Nauvoo, Ill.
O. Sneen.....Leland, Iowa
J. F. Crawford.....West Frankford, Ill.

**REBUILDING**

Subscriber.....David City, Neb.
Bill Hicks.....Lansing, Mich.
J. H. Reynolds.....Williamsburg, Iowa

**No communication not signed by the writer's name and address will be answered in these columns.**

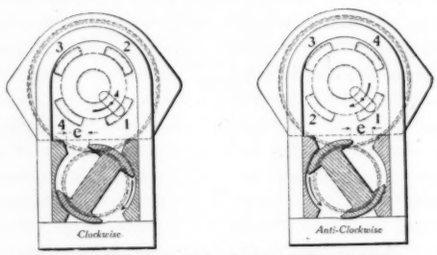



*Fig. 1—Driving end views of Bosch DU 4 magneto, showing rotation*

### Generator Reversed

Q.—I have a Delco home lighting outfit which we use for both lights and for recharging motor car storage batteries. One evening a battery was forgotten and left on charge all night, which ran my batteries down till they would not start the engine next morning. I put some dry cells on and cranked the engine by hand, jerked the dry cell wires loose and the engine kept running, but the ammeter showed a discharge. I let it run for a while and the batteries heated so much that they boiled and some of the hard rubber jars melted. I stopped the engine, traced all wires out and then started the engine again and ran it on dry cells and tested the main lead wires and the one that used to be positive is negative now, and the wire that used to be negative is positive. An electrician told me three or four ways to reverse the generator, as he said the shock I had given it from the dry cells had caused the generator to reverse itself, but none of his remedies did any good. I reversed the wires and everything is all right, but the generator is still reversed.—Thomas W. Wilkerson, Blanco, Tex.

You have not given us very definite information as to how you connected up the batteries or how many you used. But judging from the general tone of your inquiry we are inclined to believe you have a punctured field coil. This might have been caused when you started up the engine. For instance, you might not have held the starting switch down firmly enough to make contact, or too many batteries may have been used. Only three or four are required.

We would suggest that you take the matter up with the Delco distributers at Dallas, Houston or San Antonio. The names of these in the respective order are Cox & Ouradnik, E. A. Cox and Independent Light & Power Co.

### Wants Battery for Ignition

Q.—Is it possible to substitute the battery for the four dry cells which furnish auxiliary ignition to the high-tension Simms magneto on the 1915 and 1917 Maxwell 25?

2—Are the dry cells combined in the 1918 Maxwell or is a magneto of higher tension than formerly used?

3—Will the battery on the 1918 Maxwell turn over the engine faster than the previous type of accumulator?—L. Orchard, Adelaide, Australia.

1—Yes. All you have to do is to connect the wires going to the dry cells to the terminals of the storage battery. But connect them so only 6 volts are used, that is, run one wire to one of the central terminals of the battery and the other to the end or negative terminal of the same side of the battery.

2—The 1918 Maxwell is fitted with Atwater Kent ignition, current being supplied from the 12-volt storage battery.

3—According to the service department of this concern, the present starting system is much more snappy in action than those of previous years.

## Engines

### Advantage of Short Manifold

Q.—Does a short intake manifold with carbureter hung close to intake ports make any difference in running, power, and economy in fuel?

2—Should water be dropped into the intake manifold or the carbureter air intake, or taken in vapor form from top of radiator to intake manifold? Which gives the best results?—Subscriber, Moline, Ill.

A short manifold reduces condensation in the manifold and makes easier starting in cold weather. These are the two best points concerning the short manifold. It would not affect the fuel consumption, but would probably tend to produce a smoother running engine.

We do not believe that this would help you to any great extent, although it probably would prevent the formation of carbon to some extent.

### Wants Better Balanced Engine

Q.—I have a 1912 Ford which I stripped down for a speedster but am not quite satisfied with it. What approximate increase in power and speed can be obtained by enlarging valves and ports and how large can they be safely made? Should there be a difference in size between port and valve or should both be the same size?

2—I have weighed my pistons and connecting rods in pairs and they are balanced, but I cannot get much speed without vibration as though it was out of balance. Is the flywheel with magneto attached and crankshaft balanced at factory or could this be the trouble? Could the transmission be out of balance enough to cause this? How can this be remedied?—Subscriber, Moline, Ill.

1—The diameter of the valve passages can be increased about ⅛ in. without running the risk of striking a blow hole in

the casting. The same valves can be used if the diameter of the port is only increased ⅛ in. Better power and speed can be secured by attaching a 1¼-in. carbureter after increasing the size of the valve passages. The size of the inlet manifold must also be increased to handle the larger carbureter.

2—The use of light-weight gray iron or aluminum pistons will probably reduce this vibration to a great extent. A pair of Dunn's counterbalances will also help reduce the engine vibration. We do not believe this trouble to be due to the transmission being out of balance, but rather to the heavy moving parts in the engine.

### Double Plug System on Empire

Q.—Could the Empire four-cylinder speedster use a double spark plug system—that is, spark plugs over the exhaust valves in addition to those over the intake valves?—George Huycke, Topeka, Kan.

There is no reason why another set of plugs could not be installed over the exhaust ports, as you mention, but we do not think a great deal would be gained. If the plugs were on the opposite side of the present ones, it would help matters and better flame propagation would result. Locating the plugs over the exhaust valves also is detrimental to them, because they would become fouled so much easier and the points burnt away from contact with the hot gases.

### Factors in Engine Design

Q.—Is the cam and crankshaft speed the same in a four-cylinder engine? If not, would it be possible to run them at the same speed? How is the magneto and crankshaft speed rated?

2—Would it be possible to increase the power of an engine by having a longer stroke and a smaller bore? How do you rate the bore and the stroke?—Reader, Detroit.

The camshaft in a four-stroke cycle engine runs at half crankshaft speed. It is not possible to run the camshaft at crankshaft speed due to the fact that the inlet or exhaust valves open only once in two revolutions of the crankshaft. Thus the speed of the camshaft will be half that of the crankshaft. The magneto on a four-cylinder engine with a two-cam breaker runs at crankshaft speed. This is explained by the fact that the four-cylinder engine has two power impulses per revolution and, therefore, requires only two current supplies for ignition.

The power developed by an engine depends upon the average pressure throughout the cycle of operation, the area of the piston head exposed to the gas pressure and the speed of the piston. If the bore is decreased the engine can operate at a higher working pressure because the heat can be carried away faster than in a large bore engine. Obviously the higher working pressure can be expanded through a greater distance, thus necessitating a longer stroke. Other variables in the design of an engine such as size of valves, valve timing, etc., must be revamped to meet the new conditions. The small-bore, long-stroke engine that is so much in favor with present-day designers does give greater power for a certain piston displacement than the old forms of engines, in which the stroke and bore were almost the same, or they would not be used to such a great extent. A census of the 1918 cars shows that the average stroke-bore ratio is 1.25 to 1. In some instances this value is as high as

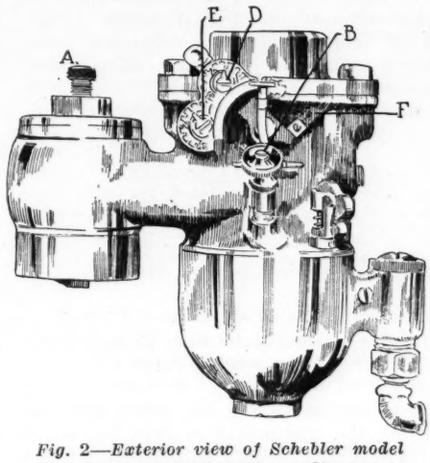



*Fig. 2—Exterior view of Schebler model L carbureter, showing where adjustments are made*

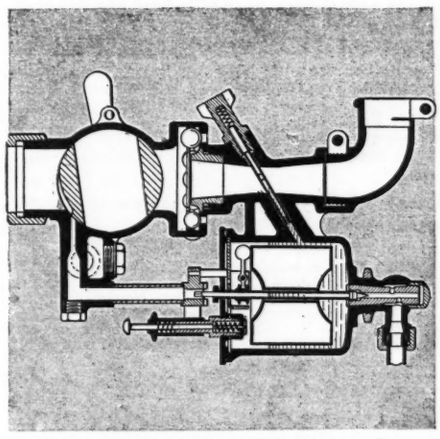


*Fig. 3—Cross section of G & A carbureter, showing arrangement of parts*

Another factor which influences the power output is the piston speed. The use of high-grade material and careful design has made it possible to reduce the weight of the moving parts in the modern engines, thus making it possible to increase the piston speed and consequently the power output. With a decrease in the area of the piston exposed to the gas pressure there are only two means available to increase the power output in small-bored engines. These are increased gas pressure and increased piston speed. In all the modern designs both of the values are increased considerably over those of the older forms of engines.

### Lining Up Pistons and Rods

Q.—Give instructions for lining up pistons and connecting rods.—O. Sneen, Leland, Iowa.

One of the simplest methods of lining up connecting rods and pistons is to have a perfect shaft the same diameter as the throw of the crankshaft. Clamp the entire assembly on the shaft and with an accurate square test the side of the piston and determine if it is at right angles with the shaft. In doing this allowance must be made for the fact that that piston may be of tapered type with the skirt slightly larger in diamter than the head.

### Drilling Pistons and Rods

Q.—Will drilling the connecting rods and pistons give any noticeable increase in power and speed?

2—I am going to install two patented rings on each piston at the top. Should I drill oil holes to allow the escape of excess oil between the third and second rings?—C. M. Smithson, Winchester, Ill.

1—Ordinary drilling of the pistons and connecting rods will not do much good in the way of adding power and speed. To drill them sufficiently the parts would be weakened considerably. Manufacturers have allowed a reasonable margin of safety and made these parts as light as possible, hence the owner had better leave them alone. It would be far better to fit some of the lightweight pistons and connecting rods on the market.

2—We do not believe this necessary, although if trouble resulted you could easly try it, without running any danger.

### Duesenberg Engine Specifications

2—What is the largest bore and stroke used in the Duesenberg engines for passenger cars? What is the brake horsepower of each? How many revolutions per minute will each turn? What is the weight of these engines?—Frank S. Johnson, Kendallville, Ind.

The four-cylinder engine is made in two sizes, both being of the eight-valve type. The largest of these engines is 4⅜ by 6 and develops 103 hp. at 2600 r.p.m. The other is 4 by 6 and develops 96 hp. at 2800 r.p.m. This engine weighs about 490 lb. We do not know the weight of the larger engine. These two engines are practically identical except for the difference in the bore of the cylinders.

## Carburetion

### Adjusting Studebaker Carbureter

Q.—Give instructions for adjusting Schebler carbureter on Studebaker.—R. M. Marlow, St. Louis, Mo.

Do not attempt to adjust the carbureter when the engine is cold. Run the engine long enough so it is operating at about average running temperature. Then fully retard the spark and throttle. You are now ready to make the adjustment. The adjustments are shown in the cross-sectional views of the carbureter in Fig. 5.

Turn the auxiliary valve cap—this is the large adjusting nut on top of the carbureter, which controls the gasoline adjustment—to the right as far down as possible.

Now turn the high-speed or auxiliary air valve spring adjusting nut—this is located beneath the auxiliary air valve chamber—to the right as far as it will go.

Leaving the two adjustments in this position, pull dash control out as far as it will go, and start the engine. When the latter starts gradually return dash adjustment to running position. Dash adjustment must be in this position before you can go ahead with the final carbureter adjustment.

Turn the axiliary air valve cap or gasoline adjustment to the left, one notch at a time, until the engine starts to miss for want of gasoline. This ordinarily will require about half a turn of this adjustment. Then turn the adjustment back, one notch at a time, until the engine fires perfectly on all cylinders. This will give the correct low-speed adjustment.

Leaving the spark retarded turn the auxiliary air valve spring adjusting nut, or the one at the bottom, to the left or down by half turns, until the engine again misses from want of fuel. This is an indication that the air valve is off its seat and the lower adjusting nut should be

turned to the right until the valve seats, indicated by the engine firing regularly on all cylinders.

### Adjusting Schebler on Crow-Elkhart

Q.—How do you adjust the Schebler model L carbureter on the Crow-Elkhart.—Walter E. Click, Elkhart, Ind.

The model L Schebler carbureter is shown in Fig. 2. Adjust the auxiliary air valve A so that it seats slightly. Then close the needle valve by turning the screw B to the right as far as it will go. Turn the screw slowly and as soon as it meets resistance do not attempt to move it farther. When the needle is seated fully turn it back five complete turns. Open the throttle about a third and start the engine. Slowly close the throttle. If the engine is not running smoothly and slowly, adjust the needle valve by B and the throttle screw F until it does. This constitutes the idling adjustment.

The dials D and E are the intermediate and high-speed adjustments. Adjust the pointer on the dial D about half way between 1 and 3. Advance the spark and open the throttle so that the roller on the track below the dials is in line with the dial D. If the engine backfires turn the indicator toward 3 a little more, or perhaps toward 1. Try them both and note which seems to give the better results. With the throttle open wide or nearly so adjust the high-speed dial E the same way E was adjusted.

If the tension of the spring on A is not correct you will have trouble at low speeds usually. Take particular pains to have the valve just seat. See that the valve is clean and does not stick.

### Makers of G. & A. Carbureters

Q.—Send me the name and address of the company which makes G. & A. carbureters, a French carbureter which has three jets. I want to put this carbureter on a Cole six speedster. Publish photograph of this carbureter, if possible.—T. T. Beynor, San Antonio, Texas.

This carbureter is manufactured by the G. & A. Carbureter Co., 450 Sixth avenue, New York. It is an automatic type with no adjustments supplying mixture for low speeds through a fixed nozzle in a venturi tube. For higher speeds the auxiliary air is supplied through ports controlled by balls. These balls are of different sizes and weights controlling air openings of different sizes.

A rich mixture for starting is supplied by auxiliary gasoline feed from the top of the throat above the throttle. Air also is furnished through opening in a tube above the throttle. This opening is closed by the throttle when the carbureter is operating in its normal manner. This instrument is illustrated in Fig. 3.

### Adjusting Carbureter for Low Speed

Q.—How can I set the carbureter on an Oakland touring car to make 4 m.p.h. on high gear? At present I can make 7 m.p.h.

2—When the carbureter is set for low mileage on high gear, does this decrease the mileage per gallon of gasoline?

3—What is the gravity of Red Crown gasoline?—J. G. Koppel, Sault Ste. Marie, Mich.

1—Not knowing the model of car which you have we can only give you some general instructions regarding the adjustment of carbureters. It is always best to adjust a carbureter for low speeds first. Set the low speed so that the engine runs smoothly. If the engine has a tendency to die the mixture is too lean and if the engine idles unevenly the mixture is too rich. After adjusting the instrument so that the engine idles well then proceed with the high speed. This should be set so that the engine will backfire through the carbureter slightly when the engine is warm and the throttle is thrown open quickly.

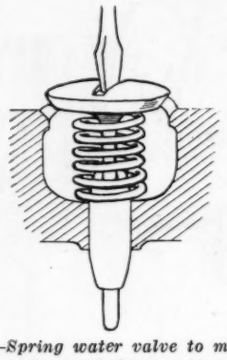


*Fig. 4—Spring water valve to make the job of grinding easier*

2—A proper mixture should give you low-speed possibilities and yet not influence the gasoline consumption.

3—The gravity of Red Cross gasoline is about 58.5 deg. Beaume.

## Miscellaneous

### Address of Body Builders

What is the addresses of the following custom body builders: Karl H. Martin, Rubay, Caffray, Keystone, Holbrook, Healy, Locke, Brewster and others you know? What is the address of the Rolls-Royce agency in the United States?—E. Sanchez Marti, Havana, Cuba.

The addresses of these concerns are as follows: Holbrook & Co., West End avenue and Sixty-seventh street, New York; Charles S. Caffrey, Camden, N. J.; Brewster & Co., Forty-seventh and Broadway, New York; Fleetwood Body Co., Fleetwood, Pa.; Hale & Kilburn Co., Philadelphia, Pa.; Healy & Co., Fifty-first and Broadway, New York; Locke & Co., 218 West Eighty-fourth street, New York; Rubay Co., 1318 West Seventy-eighth street, Cleveland, Ohio; Keystone Vehicle Co., Reading, Pa.; Karl H. Martin, 159 East Chicago avenue, Chicago.

The Rolls-Royce car is handled in this country by R. W. Schutte, 236 West Fifty-fourth street, New York.

### Lowering Ford Frame

Q.—Is it practical to install cantilever springs on a Ford chassis? Where could I obtain the necessary forgings? Where could I obtain the forgings required to lower the frame of a Ford chassis?—E. R. Carpenter, Brooklyn, Iowa.

We do not advise such a drastic change in the Ford spring suspension. The cantilever type of spring demands very rigid frame brackets, which in turn must be properly supported by frame cross members. Bear in mind there is a tremendous leverage with the centilever spring, and where these are placed on the side of the frame, obviously, the supports must be ample. Sometimes the springs are placed directly beneath the frame and in such cases the stresses and strains are not so great. But you could not place the springs this way in your case, as it would put the car up altogether too high.

You would be far better off, we believe, by sticking to the original Ford suspension, but lowering it somewhat. This you can do by the method shown in Fig. 6. It requires making several brackets, but any blacksmith can make them up for you. The cost in one case was $2.50.

The hardest part will be at the rear. The frame must be cut where it joins the rear spring saddle, or cross member. For this you need a cold chisel, hammer and hacksaw. Cut off the heads of all the rivets and

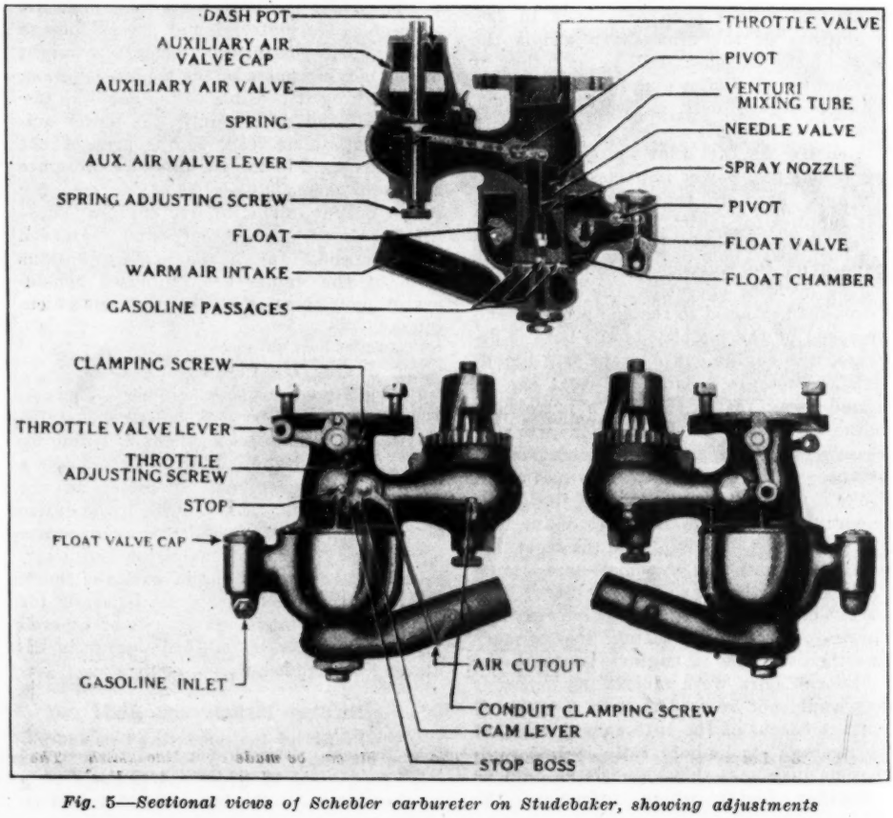



*Fig. 5—Sectional views of Schebler carbureter on Studebaker, showing adjustments*

in some instances it will be necessary to drill the rivet partly to get it out. After you have the gusset or triangular plate removed make a cut right through the frame, as shown by the dotted line in Fig. 6. While doing this have something under the rear axle for a support.

The front brackets are made of ½-in. steel 2 in. wide, shaped as shown. The other dimensions are governed by whatever amount the frame is to be dropped. The brackets fit over the front axle, being held in place by bolts passing through the same holes formerly occupied by the spring perches. The latter are cut off and threaded for a nut to hold them in the hole. Thus, you see the front cross member of frame and spring are not disturbed, nor need the radius rods be lengthened. It does, however, increase the wheelbase slightly. You can give the front axle a greater tilt by putting a small bend in that part of the bracket holding the spring perch. You also will have to do away with the spring link oilers, as they will interfere with the tie rod when the wheels are locked on a sharp turn. Close up the holes in the links with grease and drill a small oil hole in the top of the spring perch. The present Ford spring is equipped with an oil hole in the end that fastens to the link, so you will be fixed all right on this point. While working on the front axle support the frame with a saw horse on each side. This takes the weight off the spring and it is much easier to do the job.

When you have cut the rear part of the frame and drilled the holes in the brackets, clamp the latter in place with steel clamps in the position they are to occupy. Then you can spot the holes in the frame with a punch, so they can be drilled. The brackets are made of ⅜ in. steel the width of the frame. The smaller piece to go on the inside is made of $\frac{3}{16}$ in. material and has a 90-deg. bend at one end. All the holes should be ¼ in. In all there will be six holes in each of the main brackets and four in the small one. Get a half pound of ¼ by ¾ in. round head rivets. If you have a portable forge handy it will greatly facilitate the riveting, as the frame must be hot-riveted. It is also a two-man job, one to hold a hammer against the head of the rivet while the other manipulates the riveting hammer. In the absence of a forge a good brazing torch can be used.

When the job is complete the radius rods must be altered somewhat, as the latter will strike the frame, having only an inch or so clearance. To lower the radius rods bolt a piece of steel to the axle flange, using the holes formerly occupied by the radius rods. Then bolt the latter to this. Some sort of bracket will have to be made for the rods at the forward end also to lower them slightly.

### Oiling on Overland 59

Q.—The oiling system on my Overland 59 is a box with six valves, working two at a time. When the engine is idle at least two of the valves are open. What prevents the oil from running through these tubes and flooding the cylinders with oil?—Subscriber, David City, Neb.

There is a check valve at the connection on the under side of the oiler which prevents the oil from passing into the supply pipe unless it is forced into it by the small pressure pump.

### Curtains to Open With Doors

Q.—How can the side curtains of a 1916 Saxon Six touring car be arranged so that they will open with the doors, especially the front door curtains?—Subscriber, Zeeland, Mich.

This model uses the jiffy type of side curtains and it is almost impossible to remodel them so that they can be adapted to curtain carriers. In fact it would be almost as expensive as making a new set of curtains. Curtains operating on a carrier must be attached to the top quarter and not to a cord on the inside of the top. A pocket must be sewed on the inside of the curtain to take the iron and should be reinforced at the top with leather to prevent the iron breaking through. The door curtains must be independent from the others so that they can open with the doors. This type usually requires five curtains per side.

### Lowering Maxwell Body

Q.—Is there any way I can lower the body on a 1916 Maxwell 25 and have sufficient clearance?—J. B. Sears, Waverly, Ill.

It would be a very difficult matter to lower the body on this car. In the first place you would have to lower the frame and a glance at the front axle spring seat would show you what a job you are up against. The spring seats on the front axle are on top and there is a decided slope to the axle immediately under the seats. This means that if you clamped the springs to the under side of the axle you would have to fit wedge-shaped pieces to conform to the slant. Unless such work is done carefully and accurately makeshifts are the result and sooner or later the brackets become loose. Then there is another snag. The springs would interfere with the tie rod connecting the two steering arms. Other complicatoins would result, and in the long run it would be an expensive proposition. While it is true changes of this kind can be made with several cars, it is better to stick to the way it originally was designed. When you change an important part like this you cannot help but upset other features, resulting often in losing more than you gain.

### Removing End Play in Pump Shaft

Q.—I have a Hudson 6-40 on which the pump shaft is loose and I can find no remedy for same. It has about ¼ in. end play in it and rattles above 15 m.p.h. If bushed between timing gear and timing gearcase the timing gear will push the case and I cannot get a pressed filler washer to last more than two weeks if placed just back of the timing gearcase. Please advise what I can do for same.—J. F. Crawford, West Frankfort, Ill.

The end play in your pump shaft can be taken out in the following manner. In Fig. 9 is shown a cross-sectional view of the pump drive mechanism. The only way the play can be removed is by shimming back of the floating thrust washer marked A. At B is shown the stationary thrust washer, which need not be touched. To get at the floating washer knock out the pin C which anchors the part D. A little experiment will determine how thick the shim must be made to take up the play.

### Water in Grease Cup

Q.—On an Overland 89 we have had trouble with water working up through the grease cup on the water pump. What is the cause and remedy of that?

2—What can we do to get the gas knock out of an Overland 71? When we put it to a good pull and open the throttle, it gives a distinct knock. Cylinders and valves are clean.—O. Sneen, Leland, Iowa.

This is due to the hot water in the cooling system melting the hard grease and then seeping through. We would suggest that you change the grease cup and put on a type that has a shut-off cock so that it can be closed when not in use.

This can be overcome by increasing the volume of the combustion space. This can be done by removing some of the metal from the inside of the valve caps or raising the cylinder block. The former method is preferable because it does not require very much mechanical work. This might also be overcome by blending fuel so as to raise the critical temperature of fuel to prevent the temperature of combustion exceeding the spontaneous ignition point. Try 4 gal. of gasoline to 1 gal. of kerosene.

### How to Grind Valves

Q.—Explain thoroughly the proper method of grinding valves. Should the valve be turned completely or worked back and forth on the

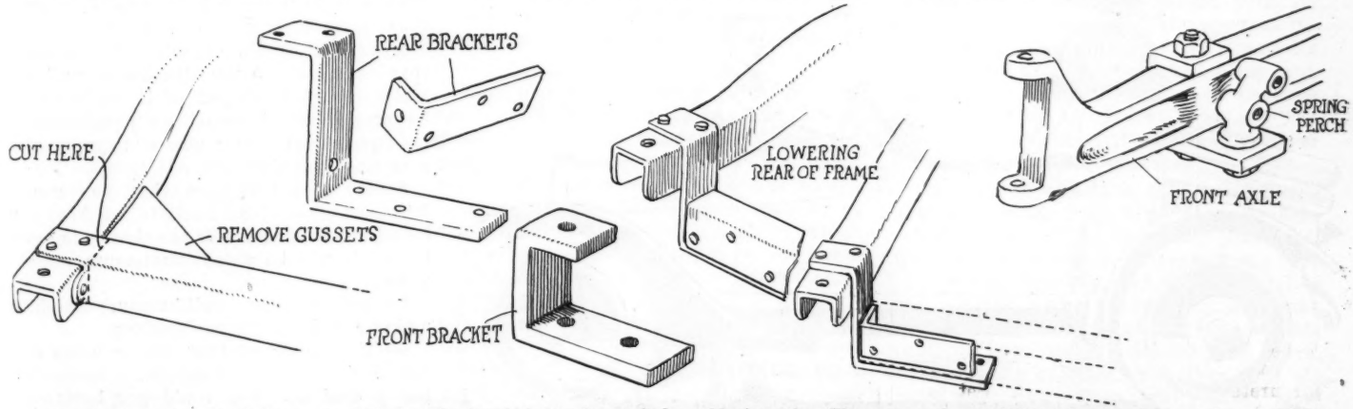



*Fig. 6—Lowering Ford frame for racing.* The brackets can be made by a blacksmith. The rear spring saddle or frame cross member must be cut off on the dotted line*

order of an eccentric?—L. L. Cambre, Nauvoo, Ill.

One of the best methods of grinding valves is to place a light coil spring under the valve as shown in Fig. 4. This will permit the valve to be lifted from its seat when grinding by releasing the pressure and thus change the position of the faces with respect to the abrasive. To impart the motion to the valve use a screwdriver that fits the slot cut in the valve head snugly and, with the handle of the screwdriver held between the palms of the hands, move the hands so that they travel in opposite directions and the handle of the screwdriver rolls between the palms of the hands. This will impart a motion such that the direction of rotation of the valve will be changed every time the hands change from forward to backward. Do not use a coarse valve-grinding compound as it cuts the seat of the valve and makes it difficult to secure a tight fit..

### Monroe Speed and Gear Ratio

Q.—What is the maximum speed of the Monroe M-5 car? How high could this car be geared?—George Huycke, Topeka, Kan.

1—We have no record of the maximum speed possibilities of this car, but this should be in the neighborhood of 50 m.p.h. The present gear ratio is 4¾ to 1, but by cutting down the body and lightening the other parts proportionally it is possible that a ratio of about 3 to 1 could be used successfully.

## Rebuilding

### Rebuilding Overland 59

Q.—Give a diagram of the Overland 59 roadster built as a racer with spare tires behind.—Subscriber, David City, Neb.

An illustration of this model rebuilt into a speedster is shown in Fig. 7.

### Speedy Fords in Michigan

Lansing, Mich., Editor MOTOR AGE—I have been a read of MOTOR AGE for a few years and have enjoyed reading of the Ford speed kings and am sending you a picture of my Ford racing car and how it is built.

Boys of this state do not seem to say very much in MOTOR AGE and I don't know just why, as we have had some very good cup races in the state of Michigan. We race mostly at Detroit. It is a good mile track and we average 60 m.p.h. on our mile tracks and on good half-mile track make 5 miles in 6 min.

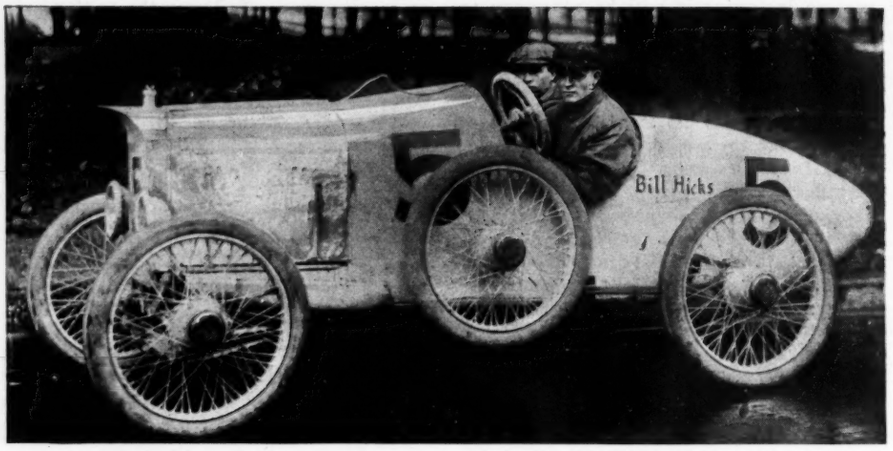



*Fig. 8—Rebuilt Ford for racing, campaigned on Michigan dirt tracks by reader*

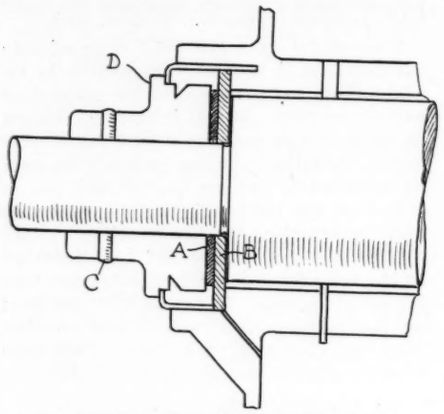



*Fig. 9—Manner of taking up end play in pumpshaft of Hudson 6-40*

Here is how I built this car. I bought a new 1916 Ford, drove it about 1500 miles and when it was good and limber tore the entire car down, sold the body, fenders, radiator, wheels, tires, front axle and carbureter. Next I cut frame off 17 in., dropped rear 6 in., took out three spring leaves, had special front axle made with 5½ in. drop, extra set of radius rods, same front spindles, cut 17 in. off propeller shaft and housing, bought set of Pasco wire wheels and Portage tires. The car has 82 in. wheelbase and is good for any track. The engine is as good as it could be had. I rebored it 1/16 in., fitted light gray iron pistons, patented rings, larger valves, 1¾ in. and bored valve ports 1½ in. Then I welded 1½ in. port pipes to 3 in. seamless tubing and carried it back. I use the same oiling system, except oil pump to add oil, when racing. The magneto is a high-tension Bosch, 1¼ in. master carbureter, while Bougie-Mercedes spark plugs are used. I made a special camshaft to open and close the valves better, built my radiator by using Overland core 3½ in. thick, 14 in. wide, 25 in. high. There is very little wind resistance and my body at the widest point is 29 in., being very narrow, with just room for two, for track work. This car weighs 1260 lbs. empty and has a speed of 67 m.p.h. with standard gears and 75 to 80 m.p.h. with 2¾ to 1 gears on good road. This car cost about $1,150, counting my labor. It has won me a lot of money. It has won in every race. —Bill Hicks.

*Fig. 7—Model 59 Overland rebuilt into speedster*

### Wants to Rebuild Buick

Q.—I have a Buick 17 touring car which has run about 30,000 miles and I would like to convert it into a truck. Can the car be made into a satisfactory truck by the use of one of the commercial truck attachments?

2—Has the chassis sufficient strength for a 2-ton truck?

3—What make of truck unit would be recommended for this purpose?

4—The car is equipped with a Schebler D carbureter. Could better results be obtained by installing some other make or later model?—J. H. Reynolds, Williamsburg, Iowa.

1—This car can be converted into a truck by using one of the commercial truck attachments. There is no reason why it should not give satisfaction, provided the chassis is in a mechanical condition such that it would warrant the expense of an attachment. If the chassis is in poor mechanical condition the attachment will not make a good truck out of it, as it would be practically the same as purchasing a poor used truck with a new rear system and a worn-out engine.

2—We would suggest that you use a 1-ton attachment as 2-ton is too heavy a load for this chassis. If the chassis is overloaded it will be a continual source of expense.

3—Any of the well-known, standard makes should prove satisfactory.

4—The carbureter that you are using was not designed to handle the present-day heavy fuel and you could get better results if a modern type of carbureter were installed.

# The Motor Car Repair Shop

## Tuning Up the Car

TUNING up a car means making such adjustments as will put the car in the best running order and applying oil to all working parts so they work in the most efficient manner. For instance, a car two or three months old may need tuning as by this time the bearings have been given opportunity to get broken in, provided the car has been carefully handled, and certain adjustments are necessary. The best car in the world demands tuning up now and then, and no owner should expect to drive day in and day out without going over the adjustments and oiling periodically.

One of the first things to do is to test the engine compression. There are compression gages on the market for this, although some owners can tell the evenness of the compression by the resistance offered while slowly cranking. If the compression is not the same in each cylinder the cause must be ascertained. If the car is an old one the piston and rings may be worn considerably. This would be characterized by poor compression in all the cylinders. On the other hand, the valves may need grinding in. A valve that is not seating perfectly tight allows gases to escape. Priming cups and spark plugs are frequently the source of compression loss. Defects can be found by squirting a little gasoline around the threads or other parts and observing if any bubbles result. Sometimes the piston rings work around so the slots are in line, which naturally allows some of the compressed gases to get into the crankcase.

**Watch the Interrupter**

Whether the engine is fitted with magneto or battery ignition, the points of the interrupter require attention now and then. They should only be filed when absolutely necessary and then only a little. Frequently all the interrupter housing needs is a little cleaning out with gasoline squirted into it with an oil can. The distributor cover of a battery system should be wiped out periodically with a cloth dampened in gasoline. The points also should be looked after and adjusted, if necessary. Nearly all the makers supply a special wrench for this fitted with a thickness gage to be used in setting the space between the points.

Although you generally are told to keep your hands off the carbureter if it is giving good results, it is well to look it over and see that none of the small screws, such as the throttle stop screws, etc., have jarred out of position. Also if there has been a noticeable change in the weather, the carbureter mixture can be altered when the engine is warm, usually by cutting down the gasoline feed. Most owners run on too rich a mixture anyway. Do not get the idea that if a little gasoline is good a lot more would be better. The best results are secured where the engine is run on a mixture that inclines on the lean side.

Those who know how sweetly an engine can run when it has been given a change of oil in the crankcase, do this frequently. It is a mistake to think that so long as you add oil to keep the supply at the proper level prescribed by the maker the engine will run all right. Analysis of the liquid in the crankcase shows that there is much water and gasoline in it. The best engine in the world cannot be lubricated properly, by such a mixture. Good oil fed judiciously, with proper draining, is the best insurance the car owner can get.

After the crankcase has been drained of all the old oil, it should be flushed out with kerosene. Put back the drain plug and run in about a gallon of kerosene through the filler. Then run the engine slowly for about a minute. When this is drained off and clean oil put into the crankcase, the engine is in shape again for several hundred more miles.

This applies also to such parts as the rear axle and gearset. At least three times a year, if the car is used right along, the differential housing should be cleaned out and fresh lubricant applied. Do not use too heavy a grease in the gearset and differential. The gears will only cut a path through it, leaving the grease on the sides of the housing, where it does no good whatever. Also, much power is consumed where the gears have to churn up a heavy mass like this. Most of the car makers state in their instruction books whether grease or oil is to be used in the gearset or axle. Many of the latest models are fitted with oil-tight transmission cases, so oil may be used instead of grease.

Other parts that need attention are the universal joints, spring leaves, links, steering connections, etc., all of which should be filled with lubricant when tuning up. While all this is going on the owner should keep a watchful eye open for loose nuts or connections. The spring clips perform a very important function and the nuts on these should be tightened, if this is needed. Other parts frequently forgotten are the brake rod ends, pedal shaft bearings, etc. All of these need oil, some more frequently than others. In any case the owner should bear in mind that wherever there is movement resulting in friction oil is needed.

Tuning up means looking after the storage battery, generator brushes, lamp bulbs, generator drive mechanism, etc. If the generator is driven by chain the latter must be cleaned occasionally and immersed in a bath of oil. The chain is made up of many little bearing surfaces, all of which need oiling. The adjustment on the chain should not be too tight, as it makes it short-lived, besides setting up a disagreeable hum. All the generator needs usually is a little oil in the cups and an occasional cleaning of the commutator with sandpaper.

There are other things to do. The fan belt, for instance, must be tightened, or the screws in the hose clamps given a turn or two. Jack up the front wheels and see if there is too much play. If there is, set up the adjustment nut a little and replace the cotter pin. A little kerosene and oil squirted on the brake band linings will soften them and make the braking action smoother. Also a little neatsfoot oil on the clutch leather, if a cone clutch, will prevent grabbing and harsh action.

Finally, the body should be gone over for loose screws or nuts on the windshield, top, etc. When this has been done the engine should be started and run to get it warm. Then the valve tappet adjustment, especially if the valves have been ground, should be checked up. Engine adjustments should only be made when the former is heated to its normal operating temperature. This applies to carbureter, ignition and valve adjustments.

## Overloading Solid Tires

TO hosts of truck drivers, solid tires are apparently nothing more than chunks of rubber fastened to the wheels—what can hurt them? They will wear out in course of time anyway, so why bother to look after them?

These big tires look so sturdy and rugged that they do not appear to need any special care. But ideas like this have cost the motor truck tire users of the country a vast sum of money in the aggregate. The severity of the performance demanded of a non-pneumatic truck tire usually more than makes up for its lack of delicacy, so that reasonable care with a truck tire is just as essential as with a motor car tire.

Overloading is one of the great abuses visited upon truck tires. In many cases overloading is intentional, but in the majority of instances the practice is carried on unknowingly or carelessly. The result is the same in either case. The overstrain soon breaks down the tire before its appointed time.

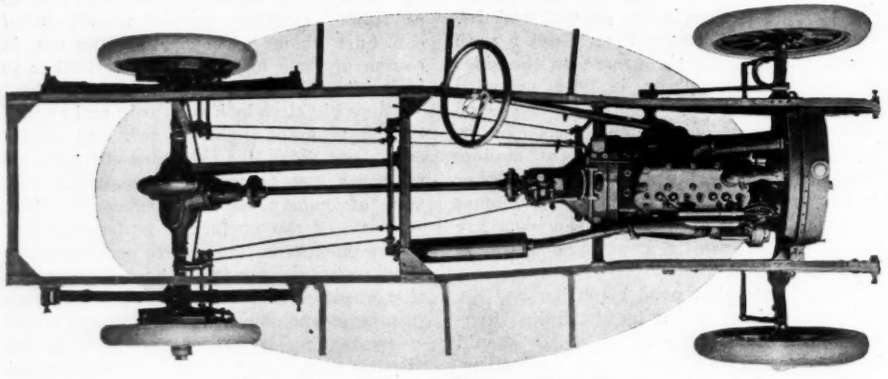
A solid truck tire will endure a certain strain and not a bit more than that. When rubber is compressed to a certain point its compressibility ceases and any pressure beyond that point causes the rubber particles to crack and separate from each other, and the tire is weakened so that it becomes more susceptible to common injuries. The life is crushed out of the tire and it never resumes its former resiliency.

Overloading, of course, is only one of the abuses to which truck tires are commonly subjected, but it is the most prevalent. Overloading is bound to increase the cost of operation greatly and while the tires are wearing away abnormally, the truck itself is depreciating at an unreasonable rate. If you must overload your truck, equip it with oversize tires when your old ones wear out. They will be far more economical in the end.—Goodyear Tire & Rubber Co., Akron, Ohio.

# Three Bodies for Collier ¾-Ton

## Light-Capacity Truck to Sell at $885 Fully Equipped

All-purpose body fitted as standard on Collier ¾-ton truck



Plan view of Collier ¾-ton truck chassis

THE truck made by the Collier Motor Truck Co., Bellevue, Ohio, is offered as a ¾-ton model with choice of three body types. The chassis has a 118-in. wheelbase with 71-ft. loading space and equipped with body sells at $885. The truck is adapted to service which requires light capacity but frequent and quick trips. The chassis is an assembled unit with Lycoming engine, Mechanics Machine Co. clutch and gearset, Salisbury axle and Goodrich and Salisbury tires and wheels.

The Lycoming engine is a four-cylinder with two crankshaft bearings, bore and stroke of 3¼ by 5 in., cylinders cast in block. Cooling is by thermosyphon and cellular radiator with pressed steel case. Ignition is by a single system with Willard 6-volt, 80-amp. hr. battery. A two-unit starting and lighting system is stock. Connecticut and Auto-Lite ignition and starting and lighting are used. The carbureter is a Zenith with gravity feed of fuel.

A Raybestos-faced, dry-disk clutch is used. A three-speed gearset is mounted in unit with the engine, the gears and rear axle with a reduction of 6, 10½ and 18 to 1 forward and 24 to 1 reverse. The drive is by a direct bevel gear through a three-quarter floating axle to the rear wheels. Propulsion is taken through a torque arm which also absorbs the braking and starting torque. The springs are semi-elliptic all around. The wheels carry 22 by 4 in. pneumatic tires.

The construction of the chassis is along conservative lines, a straight after section being used beneath the pay load and a slight bottle-neck effect forward of the center. This narrows at the front end of the frame to permit shorter turning radius and also provides a shorter supporting arm for the powerplant and radiator. The torque arm is bolted to the differential housing and to the central cross member. There are two universals in the drive. The chassis frame is of pressed steel, 4 in. deep. The steering gear is a worm and gear type with a 18 in. hand wheel and with springs in connecting link to the front axle for absorbing shocks.

The bodies provided are open express, side panel delivery and semi-closed with side curtains.

### PRODUCTION BEGUN ON NEW REO

Lansing, Mich., March 22—The Reo Motor Car Co. has started production on its new four and expects to be in full production within three weeks, when it will make seventy-five daily. Due to the heavy rains and poor roads, driveaways from the plant have been reduced over 50 per cent. Before the Monroe road was made passable the trains went via Wyandotte thence to Toledo and eastward.

### STANDARD PARTS HOLDS MEETING

Cleveland, Ohio, March 22—Early reports indicate that the first year's business for the Standard Parts Co. will show $25,000,000 in gross sales, as brought out at the meeting of representatives of the thirteen companies in the organization. This is a higher mark than that set. Christian Girl came from Washington to attend the reunion and in a talk stated that if the war should stop today the activities in industry and business now going forward would not be arrested for many years. The entire meeting was devoted to the discussion of business affairs and departmental meetings. The appointment of W. E. Perrine, now production manager, to be assistant general manager as well as in charge of production, was announced. Mr. Perrine also will be chairman of the executive board of control in the absence of Mr. Girl.

### SOUTHEASTERN BUSINESS GOOD

Detroit, March 22—Manufacturers here report good business in the Southeast. They state this part of the country is very prosperous, as even the usually poorer class is buying expensive cars. Cadillac is having the biggest percentage of increase in its history from the Southern states. The Middle West is showing gratifying increases in sales and New York and the New England states are coming back to their own.

Cadillac is not shipping any cars except limousines to any nearby points. Ohio, Indiana, Michigan and certain parts of Illinois are in the excluded territory. It is found very unsatisfactory to drive limousines so they are shipped.

Saxon is having heavy demands in Canada. The company just received an order from Toronto for five carloads. Due to heavy snows Canada could not obtain cars and is now experiencing a shortage.

Ninety per cent of the production of the Paige-Detroit is being driven away. Cars have gone as far as Fargo, North Dakota and Denver.

# 2-Ton Truck from Used Chassis

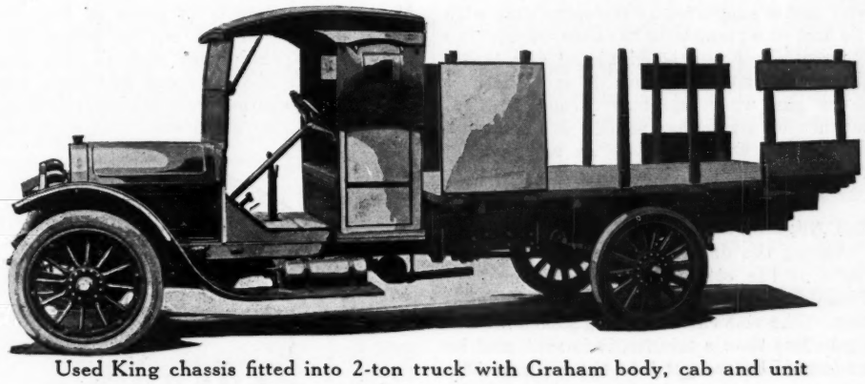
## Graham Unit Comes Complete with Cab and Body

THE Graham truck unit, made by Graham Brothers Co., Inc., Evansville, Ind., is adaptable to all makes of passenger cars and comes complete with frame, drive, rear axle, springs, wheels and mounted with cab and body. Heretofore the company made only a 1-ton truck builder for Ford cars and the 1½ to 2-ton for Dodge Brothers cars.

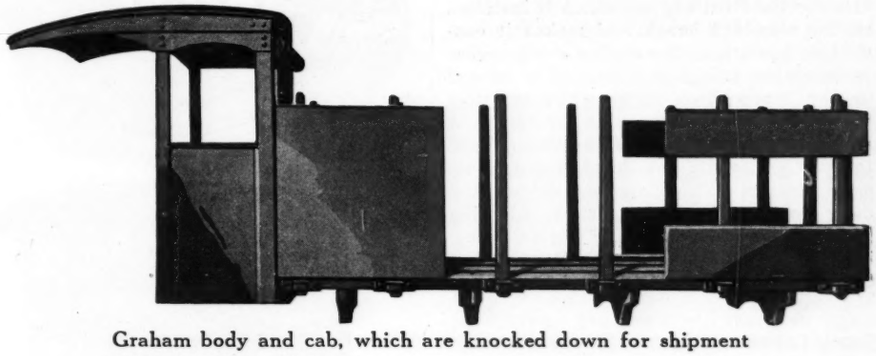
When joined to the front end of a used car the unit forms a complete truck, ready for the road. In this way it is possible to utilize old cars, the powerplant of which might still be in good order.

The frame is deep channel section heavily reinforced at the corners by gussets. A Torbensen internal-gear-driven rear axle is used, suspended from the frame by semi-elliptic springs. The springs are 46 in. long, 3 in. wide and fitted with ten leaves. Hyatt roller-bearings are used throughout. Wheels are of the heavy artillery type. There are two universals on the driveshaft, which is supported by a bracket from the front frame cross-member. In attaching the used car the frame of the latter, after being cut to the right length, is slipped between the two extensions on the truck unit and riveted or bolted in place.

The new unit is made complete with cab, and choice can be had of express or stake body. The bodies and cab are built for each chassis at the factory, hence a perfect fit is assured. The bodies and unit then are knocked down for shipment.



Used King chassis fitted into 2-ton truck with Graham body, cab and unit



Graham body and cab, which are knocked down for shipment

Graham unit. Note how frame is reinforced

### AUTOMOTIVE ENGINEERS

Indianapolis, Ind., March 22—The Automotive Engineering Co. has been organized to do a general automotive engineering business. General, production, experimental, literary, efficiency and sales engineering are included in the departments of the company. Karl Feilicke, formerly chief engineer of the Pathfinder Co., is chief engineer and will manage the affairs of the company. J. W. Coneys, superintendent of the Pennsylvania Lines, and D. P. Beach, division engineer of the Pennsylvania, with Mr. Feilicke, are the chief stockholders and directors.

### LEONARD TRACTOR ORGANIZES

Detroit, March 22—The Leonard Tractor Co., Ltd., of Canada has been organized and will erect a plant in Canada. The exact location has not as yet been fixed. According to H. M. Leonard, president, it is planned to build 2500 tractors during 1918. This concern also is contemplating the erection of a plant and may settle in Kalamazoo. A building site has been obtained there but operations will not be started in the United States. It is expected that plans will be perfected for productive operations here about Sept. 1.

The officers of the Leonard Tractor Co. of Michigan, which is a Michigan corporation and capitalized at $1,500,000, are H. M. Leonard, president; John Hurlbut, vice-president; C. W. Martin, secretary-treasurer. The Leonard Air Washer Corp., a Michigan corporation, is a separate organization building air washers on a royalty to the Leonard Tractor Co. The Leonard Air Washer Co.'s office is at Kalamazoo.

The Leonard tractor is a four-wheel-drive unit, having a capacity of three 14-in. plows and is an inclosed-transmission type. The final drive is an inclosed internal gear. The gearbox provides four speeds in either direction, and the tractor is capable of running ½ to 8 m.p.h., forward or backward. One of the features of the tractor, the makers claim, is that it requires oiling but once a year, except in the engine and universal joints. This is accomplished by a series of patent oil type housings.

### NELSON BUYS SAGINAW PLANT

Saginaw, Mich., March 22—The newly organized Nelson Bros. Truck Co., which has a capitalization of $300,000, more than half of which has been paid in, and which is to manufacture the Jumbo 2½-ton truck, has purchased the plant of the Saginaw Motor Car Co. According to the schedule, production of one truck a day will be under way within a few weeks and will be increased as rapidly as the necessary additional mechanical equipment can be installed and skilled labor secured. It is the plan of the company to erect a permanent factory building as soon as building prices drop to a lower plane.

The officers of the company are: President, Harry B. Nelson; vice-president, Clarence A. Nelson; and secretary and treasurer, Clinton J. Nelson, all of Nelson Bros. & Co., manufacturers of gasoline pumps, pump jacks and feed grinders.

# The Accessory Corner

**Continental Footrest**

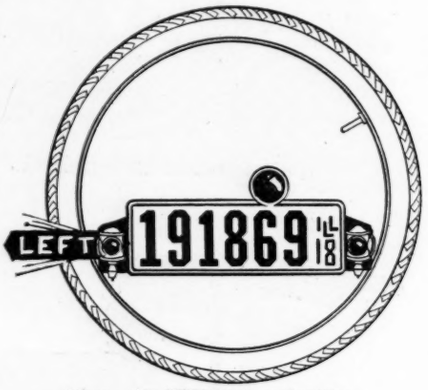
THE Continental footrest is a device whereby the foot operates the accelerater and is supported at the same time with the heel on a plane with the accelerater. The footrest is of burnished nickel and is adjustable to any position. It is claimed it saves gas, wear and tear through the insurance of a regular feeding of gas as opposed to jerky feeding by an unsupported foot. Price, $1.50.—Continental Auto Parts Co., Knightstown, Ind.

**Rod Aligning Jig**

Among the devices put out for Ford garages is the connecting rod aligning jig. This device checks the rod before installation. The rod can be straightened in the jig in less than a minute, it is said, and be made true before put into the engine. The same company manufactures a clamping device for the Ford engine, which is installed on the standard bench and makes it convenient to work on the engine at all angles. A turntable and jack combined is offered in the three-wheel dolly, which requires very little pressure to raise the car, it is claimed, it being possible to raise a Ford touring car with one hand through its manipulation. The clamping device and dolly weigh 60 lb. each. Prices: Aligning jig, with bar and clamp, $30; engine clamping device, $15; three-wheel dolly, $15.—Garage Equipment Co., 241 Fourth avenue, Minneapolis, Minn.

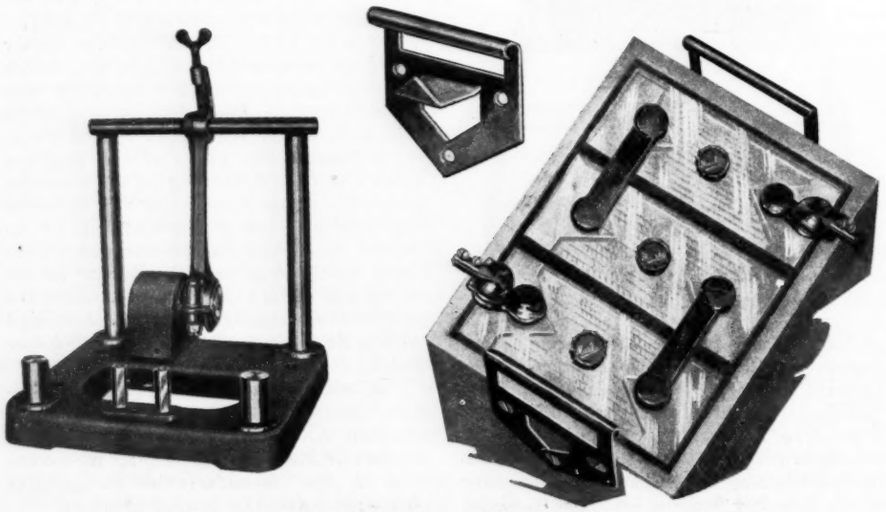
**Truck Cab**

The Detroit Weatherproof truck cab is so constructed that it can be completely inclosed, while sides, back and windshield all can be opened or closed by the driver without dismounting. Twenty-gage steel and hardwood frame, strongly reinforced, are the principal elements of construction. The cab has a 40-in. seat covered with fabrikoid, which also covers the inside of deck and doors. High-grade imitation leather is used for the exterior. The doors are sliding and push up into the deck. Celluloid lights extend far down in the sliding door panels to enable the driver to see the front hub caps at all times. Celluloid lights are also in the sliding windows, which disappear into the roof when open. The rear window is of glass in two sections, divided in the middle perpendicularly so in opening they slide to each side. The vertical sliding doors and side windows are of weatherproof material substantially built over a movable frame of long side pieces of clock spring steel with steel rod cross braces which hold the sliding panels snugly within steel channel guides. For shipment the seven units of the cab are packed in a crate that allows classification as motor car tops. All angles and corners are bolted together, and the frame bolts to the rear sides and front of the seat frame. Two workmen can uncrate, fit up and attach the cab in 3 hr., it is said.—Detroit Weatherproof Body Co., Pontiac, Mich.




*Moore signal device in operation*

*Detroit Weatherproof truck cab*



*Ford connecting rod aligning jig, left, and Marko storage battery*

**Bowling Green Tread**

The Bowling Green tread can be applied by cementing or vulcanizing. To apply it is necessary to strip the old tire of all the rubber tread down to within 1½ in. of bead, buff outer surface with buffing wheel, wash with gasoline and apply cement. Unbleached muslin from the drygoods store is used to make twelve strips 12 in. wide and 24 in. long. The muslin is laid lengthwise around the tire on each side, lapping on the middle of the tread, to protect the cement and prevent tire and tread from sticking together until tread is placed in position, after which the muslin is removed. Full instructions are given and satisfaction is warranted if followed.—Bowling Green Rubber Co., Toledo, Ohio.

**Krom-Nik Special Gears**

The Krom-Nik 4.2 to 1 gears are designed for use on commercial Ford cars. The gears weigh approximately a pound more than the standard ratio gears, and are made by the Anderson rolled process, whereby the teeth do not get into contact with a cutter and retain their intrinsic strength from the forging with the original crust and shell. The gears are guaranteed as to workmanship, and material will be replaced at any time within a year if found faulty or break because of imperfect material or workmanship. Price, $12.—Krom-Nik Gear Co., 910 South Michigan avenue, Chicago.

**Holdfast Nuts**

Holdfast nuts are complete in one piece. They are made in all styles, grades and threads and will lock upon a bolt as soon as the threads are engaged. The device is attached like an ordinary nut and wrenched into place. It has undergone rigid tests, in one of which it took 20 lb. of pull on the wrench to start backing the nut off the bolt after 60 min. vibration, at which time there was no movement of the Holdfast nut on the bolt.—Holdfast Nut & Bolt Co., 1405 Corn Exchange building, Chicago.

**Kork Tred**

Kork Tred is a transmission lining with inlays of cork and employing the compressed air principle. The distinctive feature is the air-cushioned retaining cup, which is riveted in the lining and holds the cork disk securely in the fabric. The arrangement results in a pocket of air between the cork disk and the bottom of the cap, the cork disks engaging the drum first

when pressure is applied to the brake pedal. The braking pressure compresses the air in the cups and drives the cork flush with the fabric, permitting the fabric to take its full share of the wear and allowing the cork to retain its full frictional value. When the pressure is released the compressed air in the cup brings the cork back to its original position, protruding slightly above the surface of the fabric, so that each disk possesses its entire braking value when brake pressure again is applied. Price, $2.50 a set.—Howe Mfg. Co., Chicago.

**E-B One-Man Top**

The E-B one-man top for Ford cars is constructed of high-grade 30-oz. motor car rubber and is fitted with curtain of the quick-adjusting inside style with celluloid lights. The design has been worked out for simplicity and durability by carriage builders of experience and is made to add to the appearance of any Ford car. Price, $25. — Emerson - Brantingham Implement Co., Inc., Rockford, Ill.

**Marko Storage Battery**

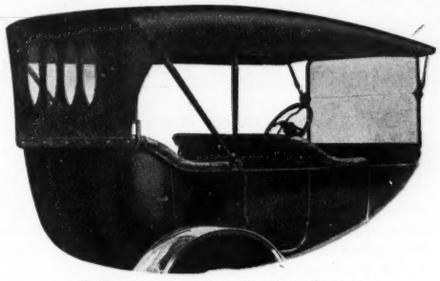
A new Marko storage battery has been brought out with individual glass covers over the cells in place of the usual opaque sealing compound. The covers are sealed in place but permit inspection of the hight of the solution and, to a certain extent, the condition of the plates. The glass is of very heavy construction and practically unbreakable. The vent plugs have no screw threads, are merely rubber stoppers. The positive and negative connectors are arranged to fasten to the battery case, where they are supported firmly. Thus, movement of the cable cannot loosen the connector from the plate or harm the glass cover. The handles of the battery are held in place by a pressed-out lug which is fitted through a slot in the battery box and then clinched over. Screws are not necessary to hold the handles and are used largely for appearance. Internally the battery is the same as previous Marko models and comes in sizes for all cars and trucks.—Paul M. Marko & Co., Brooklyn, N. Y.

**Moore Signal**

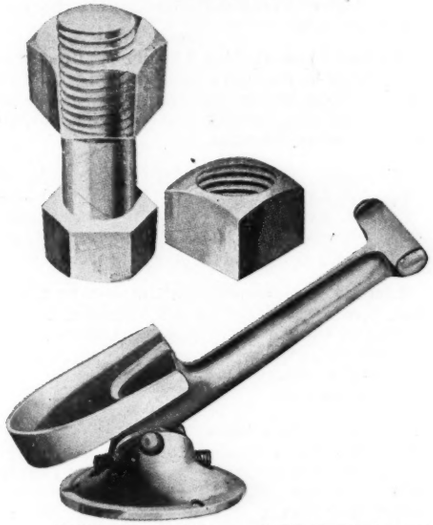
The Moore signal device for motor cars is attached to the rear of the car and is within clear vision of the driver behind when in use. It consists of an adaptation to the motor car of the railroad semaphore signal. All parts are inclosed in a dust-proof case, heavily japanned. The signal arms are of sheet aluminum, triple painted and varnished, operating out of felt-lined slots. Power is derived from the storage battery. The driver operates the device through buttons on the steering wheel. With the extension of a signal arm, red light and a bell give additional warning. The arms are readable at 150 ft., it is claimed. The push button box, with its ball and socket joint, is adjustable to any height, length and angle to suit the driver. It is lined with fiber and so designed as not to mar the post. The installation of the signal at the back of the car does not interfere with the spare tire and is concealed by the license number plate when not in use. —Moore Signal & Mfg. Co., 3300 Jackson boulevard, Chicago.

**Automatic Dryroom**

The Automatic dryroom is manufactured in small sizes for the refinisher on the same system as that used in eighty-seven motor car factories. A typical one-car dryroom is 10 by 18 by 10 ft. outside and is large enough to house any car made, it is claimed. The dryroom itself is constructed by the purchaser in accordance with the company's blueprints and is built of dressed and notched lumber or wood fiber wallboard over a light wood framework. The doors can be made of wallboard, wood or metal and swung on hinges or mounted on sliding door carriers. The equipment includes fresh air intake; air washer-humidifier; horizontal distributing duct; heaters, gas or steam; partition of corrugated galvanized sheet metal separating heaters from kiln to insure circulation; water condenser coils; vent flues; ventilator head; steam and water pressure gages; steam and water supply lines, main valves and strainers; blow-off line to air washer drain; heater and water drains; air relief vent; water automatic temperature control; brackets, blueprints, etc. Drying Systems, Inc., 910 South Michigan avenue, Chicago.



*E-B one man-top for Ford cars*



*Holdfast nut, above, and Continental footrest*

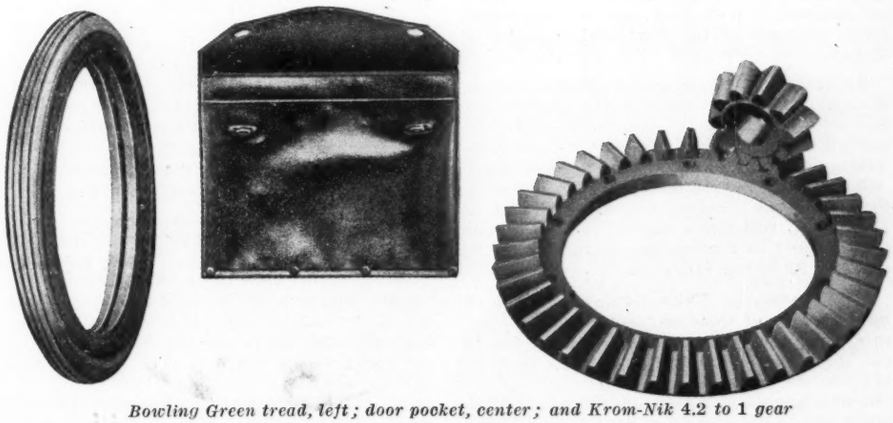
**Handy Door Pocket**

The handy door pocket for Ford cars is made of imitation leather and is a neat and compact device for carrying tools, etc. It is 9 by 11 in. and sells for 75 cents.—Hopp Carriage Co., Mifflinburg, Pa.

**National Signal Device**

With the National signal device a green signal arm is attached to the right side of the windshield and a red signal arm to the left side. A touch of the same button operates both. In case of a turn to the right, the green signal arm is dropped by pressing the button, the green electric disk lights automatically and likewise with the red signal for turns to the left. The idea back of the green on the right and red on the left is that it is used by navies, steamers and railroads in all parts of the world, being universally used and universally understood. The signals come completely equipped with electric bulbs, wiring and small bracket ready for instant attachment to the windshield of open, closed or electric car. The single control button can be located in any position most convenient for the user. The parts are machined accurately and fitted into a neat dustproof case of aluminum alloy. All parts are easily detachable. National Auto Signal Co., Inc., 140 West Seventh street, St. Paul, Minn.

*Kork Tred transmission lining*



*Bowling Green tread, left; door pocket, center; and Krom-Nik 4.2 to 1 gear*

# Among the Makers and Dealers

**6199 TONS HAULED AT 33 CENTS A TON—One 3½-ton Federal Hauled 6199 tons for a hardware maker in nine months at a cost of 33 cents a ton. Another Federal carried 186 tons in a month, making 571 miles on 135 trips**

**OHNSON Becomes Jones Treasurer**—L. R Johnson, for three years auditor of the Jones Motor Car Co., Wichita, Kan., has been elected treasurer of the company.

**Germaine to Represent Standard Parts**—G. G. Germaine has been appointed direct representative in New England of the Standard Parts Co., Cleveland, Ohio. Mr. Germaine formerly was with the Kawneer Mfg. Co.

**Coghlan Back with Klaxon**—Walter P. Coghlan, secretary of the Klaxon Co., Newark, N. J., who at the outbreak of the war joined the Navy, has been honorably discharged from service owing to an injury and has resumed his duties as secretary and sales manager of the Klaxon.

**Bridge Heads Willard Branch**—R. C. Bridge has been appointed district manager of the San Francisco district with headquarters at San Francisco. Mr. Bridge has been associated with the company on the Pacific Coast for some time. C. S. Harper, formerly district manager at San Francisco, will operate the station at Seattle, Wash.

**Collins to Manage Chevrolet Sales**—John S. Collins has resigned as sales manager of the Chevrolet Motor Co. He will be succeeded by B. J. MacMullen, who was sales manager of the Chevrolet Motor Co. of Texas, with headquarters at Fort Worth, while J. W. Hawk, assistant to the sales manager of the Chevrolet company of New York, has been appointed sales manager of the Chevrolet company of Texas.

**Kingston Products with Kemp**—Byrne, Kingston & Co. and the Kokomo Electric Co., Kokomo, Ind., have transferred the distribution of Kingston products for the New England states to William E. Kemp, New York. A large stock and repair station will be established soon in Boston, which, with that in New York, will make possible better service with regard to repairs and deliveries to the users of Kingston products.

**6000 Employees Take Goodyear Stock**—A new offering of Goodyear stock has resulted in 6000 of the employees taking from one to ten shares. The amount subscribed by them is in excess of $1,300,000. A plan was worked out whereby all employees might acquire the stock on the installment-payment plan. Payment is made by deduction from salary of the subscriber at the rate of $4 a month for each $100 share. No person was allowed to buy more than ten shares. Interest at 6 per cent will be charged against deferred payments and dividends credited quarterly at the rate of 8 per cent.

**Barton Back at Olds Factory**—N. W. Barton, formerly manager of the Chicago branch of the Olds Motor Works, has been transferred to the factory and will be eastern division sales manager.

**Campbell Is Now with Hupp**—Walter Campbell has been appointed assistant supervisor of materials at the Harroun Motors Corp., Wayne, Mich. Mr. Campbell was formerly with the Hupp Motor Car Co.

**Lindsey to Manage Olsen Unit**—C. E. Lindsey, former manager of the Windsor, Mich., branch of the Swedish Crucible Steel Co., succeeds F. W. Prothero as sales manager of the Swedish Crucible Steel Co., maker of the Olsen truck unit.

**Georgia Dealers Have Their Week**—Dealers in Georgia had a week all their own March 10-17. Atlanta distributors made special efforts to give Georgia dealers the necessary cars for large driveaways during the week. Many dealers visited Atlanta for cars.

**McCulla Becomes Overland Dealer**—Harold H. McCulla, formerly special representative for the Willys-Overland Co., has taken over the Overland-Nebraska Co. at Norfolk, Neb. Mr. McCulla has been in the industry since the early days, when he was mechanician to his brother, W. R. McCulla, now engineer in the aircraft division of Willys-Overland. He was relief driver in the 24-hr. races and after that went through the mechanical departments of E. R. Thomas and Hudson.

**American Magneto Moves Equipment**—The equipment of the Elkhart and Swiss magneto companies, Monroe, Mich., is being moved to Toledo, Ohio, where the firm is to be established. The property is being moved by motor truck. The American Magneto Co. of Toledo recently purchased the Swiss Magneto, successor to the Elkhart. The concern also will build a line of fractional horsepower engines under the Jeannin patents covering single-phase engines. The new plant, comprising three buildings, will cover an entire block and have 60,000 sq. ft. of floor space. The former buildings at Monroe are for sale. The officers of the American Magneto Co. of Toledo are: President, A. A. Meggett; vice-president, W. C. Carr; treasurer, W. M. Richard. The concern is capitalized at $500,000, and manufacture will start within a month.

**Closter Is Federal District Manager**—L. A. Closter of Chicago has been appointed district manager for the Federal Motor Truck Co., Detroit, in Michigan, Indiana, Ohio, Kentucky, West Virginia and western Pennsylvania. Mr. Closter was associated with E. C. Brady, Cole distributor in Chicago, and later with the Centaur Motors, Inc.

**Walton Gets Commission in Army**—A. B. Walton, former sales manager of the Master Carburetor Corp., has been commissioned a captain in the Ordnance Department. Captain Walton spent three weeks at the plant of the Mitchell Motors Co. of Racine, Wis., attending the ordnance instruction school, and is now at the Holt Mfg. Co., Peoria, Ill.

**Automatic Device for Dump Bodies**—The Prothero-McGinnis Automobile Co., Baraboo, Wis., which has been assembling motor trucks and truck attachments in the machine shop of its garage at Baraboo, Wis., for several years, is developing an automatic hoist for use on motor truck dump bodies. Production will be undertaken at once.

**Service Truck Holds Third Convention**—The third annual convention of the Service Motor Truck Co. salesmen, dealers and managers was held recently at Wabash, Ind. The output of the plant will be increased to fifty trucks per day beginning April 1, not including the Liberty trucks, which are to be turned out at the rate of 100 a month April 1.

**Allen to Leave Fuller & Sons**—Gould Allen, sales manager of Fuller & Sons, Kalamazoo, Mich., has resigned, to take effect about April 1, and will accept the managership of the Detroit office of the Wetzel-Hall Co. Mr. Allen formerly was secretary of the Harrison Radiator Co. of Lockport, N. Y., and for five years was sales manager of the Covert Gear Co., Detroit.

**Grand Rapids Dealers Herald Season**—The Grand Rapids Automobile Business Association held a dinner at Grand Rapids, Mich., as a sort of rally point for the opening of spring business. An optimistic tone prevailed throughout and the dealers were informed of the necessity of the car and the necessity for business in and above Grand Rapids. The speakers were City Manager Cummin; Alvah Brown, chairman of the Kemp Road Commission; E. W. Booth, publisher of the Press; President C. J. Licsther of the association, Former President Ray E. Becker.

**New Reo Welfare Head**—Dr. A. N. Lawrason has resigned as head of the welfare department of the Reo Motor Car Co., Lansing, Mich., and will be succeeded by R. G. Grammel, who has had charge of the adjustment department under Dr. Lawrason. The welfare department now employs thirty-six persons and consists of the accounting division, which handles the department's finances; adjustment division and clearing house for transactions among Reo employes; division of visitations, or personal touch department; social and educational division; motion picture division and cafeteria. The present safety division was organized originally un-

der the welfare department. The Reo clubhouse was one of the recreational institutions promoted by the department. In it are given concerts, movie programs, fairs, lectures and other forms of entertainment. It is equipped with a cafeteria, large auditorium, bowling alleys, billiard rooms and every convenience for the enjoyment of the employees' leisure time.

**New Truck Company at Saginaw**—A new organization to be known as the Nelson B. Ross Motor Truck Co. has been formed at Saginaw, Mich. The firm is capitalized at $300,000 and will make heavy trucks.

**Eminger With Dayton Electrical**—C. F. Eminger has resigned as sales manager of the Splitdorf Electrical Co. of California and will be director of sales for the Dayton Electrical Mfg. Co., Dayton, Ohio. The Dayton company will manufacture an entire new line of Ford starters and motor boat lighting outfits.

**Barnhart Is Stationed at Capital**—William P. Barnhart has been made assistant director of sales for the United States Motor Truck Co. with offices in Washington, where he is handling the allied business of the Stewart Iron Works and the United States Motor Truck Co. The Stewart Iron Works is the company from which the United States Motor Truck Co. originated.

**Monroe Steps Up Production**—The Monroe Motor Co., Pontiac, Mich., gradually is stepping up production to normal again through the use of coal cars for shipping and driveways, which are taking away a considerable number of cars daily. The railroad embargo and the condition of highways have held up prooduction to a large extent for the last ninety days.

**Kansas Dealers Want Better Roads**—Good roads and plans for beginning an intensive membership campaign formed the main topics for discussion at the annual meeting of the Automobile Trade Association of Kansas. A resolution was adopted pledging the association to assist in every way possible in securing more hard surface roads. Petitions are being circulated in Onaga for hard-surfaced roads and it is predicted that at least 100 miles will be built in the next five years. The officers for 1918 are: Harry Imes, Topeka, president; A. B. Kirkpatrick, Topeka, treasurer; Ray Lattner, Topeka, secretary. A goal of 300 members before another year has been set.

**Ohio Revives Trade Association**—Much enthusiasm is being shown by Ohio in the revival of the Ohio Automobile Trade Association. During the last month more than 100 members have been received, and applications are coming in at the rate of about five daily. Get-together meetings are being held at various points in the state. A. E. Mitzel, president, and Arthur M. Crumrine addressed the assembled dealers and garagemen to explain the object of the organization. The association is making a record of all mechanics employed in the sales offices, repair shops and garages in Ohio to aid the Government in its work of conscripting mechanics for war service. Many garagemen are trying women as washers and mechanics.

**275 CARS IN ONE DRIVEAWAY**—This show 275 cars lined up in front of the Willys-Overland administration building. The cars were driven away by the Gibson Co. in one day. Lined up they stretched two blocks on both sides of the parkway

**Republic Tire Distributor Organizes**—The Republic Tire Co. of Milwaukee has been organized by Dean R. Williams and George M. Wolff to act as wholesale and retail dealers in Republic tires in Milwaukee and Wisconsin. Offices and warerooms have been opened, and Arthur Engle has been appointed manager.

**Harness Maker to Handle Tires**—The J. C. Nichols Co., Sheboygan, Wis., has increased its capital stock from $75,000 to $300,000 to accommodate the increase in its business and to provide for the establishment of a tire and rubber department, which will act as exclusive distributor of the Gillette tires in Wisconsin. The Nichols company formerly was located at Janesville, Wis., and is a large manufacturer and jobber of saddlery and harness.

**Pioneer Dealer Turns Inventor**—Hans Sattler, a pioneer motor car dealer of Eastern Wisconsin, has disposed of his retail business at Sheboygan, Wis., to devote his attention to the manufacture of a speed and mileage-recording device, which he has designed and protected with patents. Mr. Sattler is opening a factory in his former garage and service building. He engaged in the sale of cars twenty years ago, and since 1909 was exclusive dealer in the Overland in Sheboygan county.

**Cluff Is Mason Assistant Treasurer**—W. A. Cluff, auditor of the Mason Tire & Rubber Co., Kent, Ohio, has been elected first assistant treasurer of the company and also has a place on the board of directors.

**Prescott to Manage Disco Sales**—Harry F. Prescott has been appointed sales manager for the Disco Electric Mfg. Co., Detroit. Mr. Prescott has had a varied career, his work ranging during the last fifteen years from engine room service at sea to district sales manager of the Saxon Motor Car Co.

**Fletcher Carbureters for Hurlburts**—The Fletcher carbureter will continue as regular equipment on the product of the Hurlburt Motor Truck Co., the contract for 1918 having just been closed. The Hurlburt company has refinanced recently and now has contracts for 1918, which will net a profit of slightly more than $1,000,000. A schedule of 1800 trucks during the year has been laid out.

**Electrical Concern Reorganizes for War**—The Lake Superior Electrical Co., organized two years ago at Superior, Wis., to manufacture automatic signal and controlling devices for motor vehicles, etc., has increased its capital stock from $50,000 to $250,000 to handle its Government contracts. At the same time the corporate name was changed to Benson Electric Co. Melvin B. Benson is president and chief engineer.

## MAIL TRUCKS FOR MAN POWER

(*Concluded from page 9*)

The capacities of the trucks used on the haul of these eight routes approximate 1½ tons. Pneumatic tires are used on most of them, the size being 36 by 6 in. There is one man on a truck who looks after the mail, as well as the parcel post. Regular parcel post rates are charged and the driver can collect packages from one point and deliver them to another point on that route without the parcels having to go into a postoffice. He carries the necessary stamps and has the power to cancel them, in fact he transacts a regular postoffice business while on the truck.

The first of these routes was started in December, 1917, with the exception of two Maryland routes which had been in operation before that time.

There are many sections in the country where railroads do not offer the necessary transportation for mails and where motor systems such as these are essential. In Oregon there is one route of 135 miles, on which are seven postoffices of the presidential class that are served exclusively by motor vehicles. Twenty-four vehicles are necessary to serve the territory. Similar conditions exist in the East. For example, McConnelsburg, Pa., a city of 5000 population, has no railroad facilities and has to rely entirely on motor vehicle service.

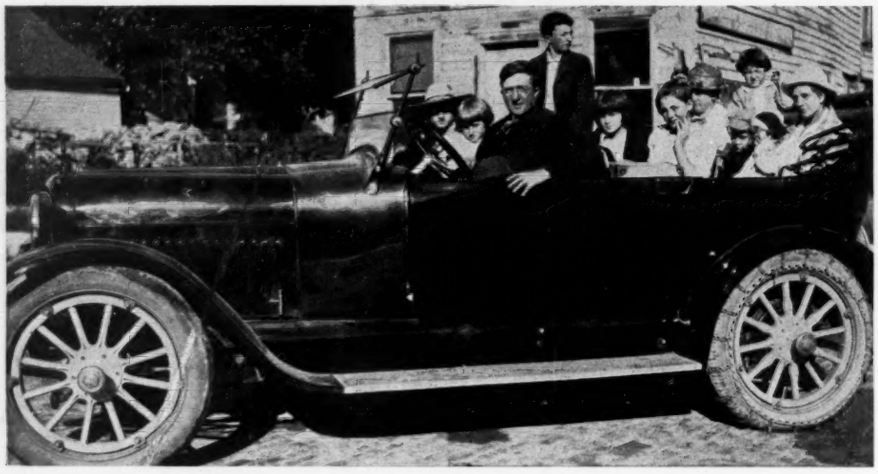
## LIGHTING ON MOTORCYCLE

(*Concluded from page 33*)

As will be seen from the illustrations the tests were made on a test stand, the engine driving through a chain to a jackshaft to which an electric generator could be connected by a friction clutch.

In connection with the set of curves marked D it should be pointed out that the regulator of this type generator was disabled as soon as the tests started and the representative then obtained a stock regulator used by the maker on motor car equipment. The result was that regulation was rather unsatisfactory. The generator was tested anyway.

# From the Four Winds



**THE MORE THE MERRIER A-MOTORING—How many with camp outfit and baggage can comfortably take a 1000-mile cross-country trip in a touring car? Ask Supt. W. S. Dickens of the Red Lake Chippewa Indian Reservation and he will answer, "Oh, eleven or more." He and wife and all the young Dickenses with a few cousins for good measure, eleven of them altogether, motored in their seven-passenger Paige car from the Chippewa Reservation in the northern wilds of Minnesota down around into Iowa and back again, some 1000 miles. They carried a tent, eleven blankets, complete camping outfit and suitcases and the thousand and one things needed for the children**

**DEALERS and Farmers at School**—About 100 dealers attended the tractor school of the Ohio Moline Plow Co. recently in addition to 100 farmers and more than 100 tractors were sold on the sample floor during the session. The school was called particularly for educational purposes.

**New Ohio Driveway Route**—A new route through Ohio for driveways has been announced by the Lincoln Highway Association. It is via Toledo, Fostoria, Bucyrus, Mansfield, Olivburg, Ashland, Canton, East Liverpool and Beaver, Pa., to Pittsburgh. The route out of Detroit via Lima, Springfield, Columbus, Ohio, and Pittsburgh, following part of the National Old Trails road, has been rendered impassable by the collapse of the Ypsilanti bridge.

**Getting Cars Under Difficulties**—Twenty-one young men who left Danville, Va., nearly two weeks ago for Detroit to drive back cars for an agency returned safely after a tedious journey of more than 900 miles. No accidents marred the trip and all the machines were brought in in good condition. At one point in Pennsylvania it took two days to cover 30 miles, there being a bad stretch of mud on the road in which 129 trucks on their way to an Atlantic port had become stalled. Teams were kept busy hauling the cars, some of them so deeply stuck that only half the wheels could be seen. The trip cost the garage company $1,200.

**Car Insurance Writers Organize**—The Milwaukee Automobile Insurance Exchange has been organized among twenty-five motor car insurance agents at Milwaukee, Wis. It is stated that the primary object of the organization is to eliminate abuses and nuisances which have crept into the business mainly by reason of its extraordinary growth in recent years and to eliminate all persons not actively engaged in the insurance business from receiving commissions or other perquisites or from carrying on a motor car coverage business as an adjunct to a distributer's or dealer's business. The insurance men feel that dealers and sales, especially the latter, should not divide premium commissions with agents or companies any more than they should split their commissions on car sales.

**Greenville Holds Its First Show**—The Greensboro, N. C., show, its first, had sixty cars on display. Motor trucks also were displayed. Attendance from out of town was excellent, and the show was considered a thorough success. John Kelly was manager.

**Seventy Cars Vanish at Columbus**—Seventy motor cars, valued at $83,730, have been stolen at Columbus, Ohio, since Jan. 1. All but eleven, valued at $13,375, have been recovered. Council members hope, by means of an ordinance adopted recently, calling for registration and public inspection of all cars bought by second-hand dealers, to eliminate the sale of stolen cars.

**Making the Most of Freight**—Interesting figures concerning the loading of railroad cars under recent orders to use the entire capacity of rolling stock have been issued by the Milwaukee committee on car service. It is shown that the Nash Motors Co., Kenosha, Wis., by double-decking cars, removing top and glass front, is able to ship four cars in a 36 or 40-ft. car, compared with two previously, and six in a 50-ft. car, compared with three before. The method of loading means 100 per cent in car saving. The J. I. Case T. M. Co., Racine, Wis., has made an increase of 76 per cent in the loading of tractors for export by ingenious methods of utilizing the entire space in freight cars.

**Truck Traffic on the Lincoln**—No less than 385 motor trucks were counted passing over the Lincoln Highway bridge on the Passaic river at Newark, N. J., in an hour recently. The daily tonnage over the bridge averages 10,000 tons.

**Truck Delivers 20 Tons Daily**—The Morris-Beck Co., Punxsutawney, Pa., coal dealer, has a Maxwell truck whose record it is proud of. The one truck hauls 20 tons of coal every 8 hrs. It started work Oct. 1. One of its loads tipped the beams at 4120 lbs., and the truck handles more than 2 tons right along.

**Wisconsin to Use Many Signs**—The Wisconsin state highway commission, Madison, Wis., has estimated its season's supply of of road markers, signs and danger signals as follows: 5000 mile markers, 1000 direction signs, 500 patrol signs, 300 danger signs and from 2000 to 2500 posts. These will be placed on the new state trunk highway system so far as completed.

**Motorists Form Protective Association**—Car owners of Douglas County, Illinois, have formed a protective association to be called the Douglas County Automobile Association. The purpose is to stop car thefts in the territory. Dues are to be $2 a member, and an assessment of $1 is to be collected from each member whenever a car is stolen to defray the expenses of finding the car and prosecuting the thief.

**Dodge City Plans Tractor School**—Dodge City, Kan., which heretofore has held a motor car show, last year a tractor and motor car show, this year will hold instead a tractor school. The school will be conducted by the International Harvester Co., which will provide equipment and instructors. The chamber of commerce will provide the theaters for the classes and the ground for the display of the tractors.

**Ohio to Complete National Highway**—Instructions have been issued by Ohio officials to finish the gaps of the National highway between Columbus and the Ohio river. Recently a tour of the road was made by Governor Cox and other state officials, and it was found that several stretches are still to be improved to make an ideal highway to the east. Convicts will be used to complete the work, which will be rushed as rapidly as possible. It is said forty Army trucks will be moved from the West to the Atlantic seaboard and the National highway will be used. In Muskingum County a stretch of 12 miles will be paved with brick and in Guernsey County crushed stone will be used.

**Pioneer Steamer Inventor Retires**—John Henry Optenberg, who is credited with being the first man in Wisconsin to build and successfully operate a self-propelled vehicle, has retired from active business life as head of the Optenberg Iron Works, Sheboygan, Wis. He has been in ill health for nearly a year. In 1878 Mr. Optenberg, attracted by an offer of a $10,000 prize by the Wisconsin legislature, constructed a steam car which was entered in a competitive tour of 200 miles. Mr. Optenberg's vehicle was the only one to complete the trip. Parts of the old-time car are still on exhibition at the Optenberg plant, which manufactures steam power plant equipment and acessories. The concern was founded in 1884.

## Coming Motor Events

**SHOWS**

March 25-30—Rochester, N. Y.
March 30-April 7—Chicago.
April 1-6—York, Pa.
April 3-6—Battle Creek, Mich.
April 5-8—Green Bay, Wis.
April 9-13—Stockton, Cal.
April 9-13—Parsons, Kan.
April 16-20—Savannah, Ga.
April 16-20—Deadwood, S. D.